SUSTAINABLE COMPETITIVE ADVANTAGE IN PFI

A SYSTEMATIC AND HOLISTIC APPROACH TO IDENTIFY THE CSFs IN RISK MANAGEMENT IN PFI, TAKING INTO ACCOUNT THE WHOLE LIFE CYCLE

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Submitted in Partial Fulfilment of the Requirements of the Degree of Doctor of Philosophy, April 2002

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Acknowledgements

I wish to express my gratitude to Professor Martin Betts and Professor Luis Tadeu de Almeida, my joint supervisors, for their support and encouragement throughout the entire period of my research.

My special thanks to Dr. David Eaton for his invaluable assistance, continued support, encouragement and patience.

I would like to thank all staff from the School of Construction and Property Management of Salford University and from the Departamento de Engenharia e Gestão do Instituto Superior Técnico for their help during this period.

My thanks to my colleagues in my Department in Lisbon and to my research colleagues in Salford. Their insights, opinions and support were of great value to my research and for myself.

I would like also to express my gratitude to all that contributed to my research, making themselves available for interviewing and also providing material for my research.

Thanks to my parents, all my family and friends for their support. Finally, a very special kiss to my sons and daughter: Luis Miguel, Maria Joana and Filipe Manuel for their love, encouragement and patience during this period as my time was short for them.

Declaration

The thesis includes material that has been published in international refereed publications, proceedings of scientific refereed meetings and as working papers of the Centre of Business Studies of Instituto Superior Técnico (CEG-IST).

Articles in International Refereed Publications

M.T. de Lemos, M.Betts, D.Eaton, L.Tadeu de Almeida, *Private Finance a y y u y y u u Initiative (PFI) Case Study Lus p nte,*
International Journal of Project Management, (submitted under revision) 2002.

M.T. de Lemos, M.Betts, D.Eaton, L.Tadeu de Almeida, *M del f r Management f Wh le Life Cycle Risk Uncertainty in the Private Finance Initiative (PFI),*
Journal of Project Finance, Winter 2000.

M.T. de Lemos, M.Betts, D.Eaton, L.Tadeu de Almeida, *Fr m C ncessi ns t Pr ject Finance and the Private Finance Initiative, PPP PFI,*
Journal of Project Finance, Fall 2000.

Proceedings of Scientific Refereed Meetings

M.T. de Lemos, M.Betts, D.Eaton, L.Tadeu de Almeida, *The Sustainable C mpetitive Advantage f Private Finance Initiative Pr jects,*
XII Jornadas Luso-Espanholas de Gestão Cientifica, 10-12 April 2002.

M.T. de Lemos, M.Betts, D.Eaton, L.Tadeu de Almeida, *Gestã de Risc num Pr ject de C nstruçã ,*
Construção 2001, Lisboa 17-19 Dezembro 2001.

M.T. de Lemos, M.Betts, D.Eaton, L.Tadeu de Almeida, *Wh le Life Cycle Risk Management,*
NATO Advanced Research Workshop – Assessment and Management of Environmental Risks, Lisboa, 2000.

Working Papers

M.T. de Lemos, M.Betts, D.Eaton, L.Tadeu de Almeida, *Critical Success Fact rs in PFI Pr jects,*
CEG-IST Working Paper n.4/2002.

M.T. de Lemos, M.Betts, D.Eaton, L.Tadeu de Almeida, *The Adjustment f PFI Pr jects t Small and Medium Size Enterprises,*
CEG-IST Working Paper n.1/2002.

M.T. de Lemos , *Learning fr m PFI Case Studies,*
CEG-IST Working Paper n.21/2001. (presented at the workshop The Experience of PFI in the UK and Project Finance in Portugal, 19th January 2001, Lisbon Portugal).

M.T. de Lemos, M.Betts, D.Eaton, L.Tadeu de Almeida, *Private Finance Initiative (PFI) Case Study Vict ria D ck Primary Sch l,*
CEG-IST Working Paper n.13/2001.

M.T. de Lemos, M.Betts, D.Eaton, L.Tadeu de Almeida, *Private Finance Initiative (PFI) Case Study J int Services C mmand Staff C llege,*
CEG-IST Working Paper n.9/2001.

M.T. de Lemos, M.Betts, D.Eaton, L.Tadeu de Almeida, *Private Finance Initiative (PFI) Case Study Indáqua Feira – Stª Maria da Feira Water Supply and Waste Water Sewerage,*
CEG-IST Working Paper n.8/2001.

Abbreviations

4Ps - Public Private Partnerships Program

ADR - Alternative Dispute Resolution

ASB - Accounting Standards Board

BAFO - Best And Final Offer

BOO - Build Own Operate

BOOT - Build-Operate-Own-Transfer

BOT - Build-Operate-Transfer

BP - British Petroleum

CC - Convergence Criteria

CEG-IST - Centre of Business Studies of Instituto Superior Técnico

CSF - Critical Success Factor

CSR - Comprehensive Spending Review

DBFO - Design-Build-Finance-Operate

DCMF - Design Construction Management Finance

DETR - Department of the Environment Transport and the Regions

DM - Defence Management

ECU - European Currency Unit

EFL - External Financing Limit

EIA – Environmental Impact Assessment

EIB - European Investment Bank

EMS - European Monetary System

EMU - Economic and Monetary Union

ERM - Exchange Rate Mechanism

EU - European Union

FRS5 – Financial Reporting Standard 5

GATTEL - Gabinete da Travessia do Tejo em Lisboa

GDP - Gross Domestic Product

GMP - Guaranteed Maximum Price

GSA – Global Settlement Agreement

HCH - House of Commons Hansard

HMPS – Her Majesty Prison Services

HRA - Humans Rights Act

IAPMEI – Instituto de Apoio às Pequenas e Médias Empresas Industriais

IFC - International Finance Corporation

IST – Instituto Superior Técnico

IT - Information Technology

JSCSC- Joint Services Command and Staff College

KM - Knowledge Management

KSF - Key Success Factor

L.C. - Laing Construction

MoD - Ministry of Defence

NAO - National Audit Office

NHS - National Health Service

O/M - Operation and Management

OJEC - Official Journal of the European Community

PFI - Private Finance Initiative

PFU - Private Finance Unit

PPP - Private/Public sector Partnership

PRAM - Project Risk Analysis and Management Guide

PS - Socialist Party

PSBR - Public Sector Borrowing Requirement

PSC - Public Sector Comparator

PSD - Social Democrat Party

PSNCR - Public Sector Net Cash Requirement

PSNI - Public Sector Net Investment

PUK - Partnerships UK

PURPA - Public Utility Regulatory Policy Act

QCA - Community Support Framework.

RM - Risk Management

SBU - Strategic Business Unit

SCA - Sustainable Competitive Advantage

SCUTs - Shadow Toll Roads (Sem Custo para o Utilizador)

SIMRIA - Sistema Multi-municipal de Recolha, Tratamento e Rejeição de Efluentes da Ria de Aveiro

SME - Small and Medium Enterprise

SPV - Special Purpose Vehicle

TQM - Total Quality Management

UK - United Kingdom

US - United States

USA – United States of America

USSR - Union of the Socialist Soviet Republics

VE - Victory in Europe

VFM - Value For Money

WLCRUM - Whole Life Cycle Risk Uncertainty Management

Abstract

Sustainable Competitive Advantage in PFI

A systematic and holistic approach to identify the CSF in Risk Management in PFI, taking into account the whole life cycle

Taking into account the envisaged future expansion of PFI this study main goal was to assess and propose a model for the Sustainable Competitive Advantage of PFI. The model integrates an Adequate Social Political Economic Framework, with the management of risk uncertainty over the whole life cycle and the Critical Success Factors of a PFI, which are Clear Strategy, Effective Leadership and Knowledge Management.

The political and economic context was determinant for PFI emergence and development. It was a response to government needs for funding, and was favoured by the political and macro economic environment. Nevertheless the framework for risk allocation between the private and public sector is not as through as could be desired. RM techniques are used extensively, but often fail to account for the holistic, systemic, long-term nature of the projects.

PFI delivers VFM, as the focus on measures to control costs is always present. It delivers a better service although customer responsiveness is derived mainly by the necessity to comply with the contracted service provision.

PFI is a competitive procurement tool versus the traditional forms of governmental procurement as it induces improvements in: Efficiency, Quality, Innovation and Customer Responsiveness. Increased efficiency is brought by the need a strict cost control to deliver VFM. 'Freedom to innovate' is key as it gives the private sector the opportunity to propose less costly solutions over the whole life cycle.

The research permitted to conclude that the sustainability of PFI's competitive advantage is going to depend upon the continuing focus throughout the whole life cycle on efficiency gains (cost control), innovation, quality and provision of a better service.

A case study methodology was used to test and validate the proposed models.

CHAPTER 1

Introduction

1.1 Introduction

Since the mid 20th century in the USA and, more recently, since the 1970s in Europe, Asia and other Developing Countries, national governments have increasingly used private capital to implement infrastructure projects and to provide services previously in the scope of the public sector. Following this trend, in 1992, the United Kingdom (UK) Government announced the Private Finance Initiative (PFI), a guidance and a legal framework for concessions in the UK. Its main objective was to encourage private capital investment into public projects. The underlying logic being to profit from the private sector's efficiency and allocate the project risks to the part best able to manage them. The impact of PFI has been felt in both the public and private sectors, in particular in the construction industry. There is now the widespread practice of management tools like: whole life cycle costing, risk management and benchmarking. Although it has permitted the launch of several major projects, its development was beyond expectations during the first years. It was only after 1997 that combined government enforcement, clarification of the regulatory environment and the accumulated experience by both the public and private sector, that PFI gained momentum. According to the forecasted government spending plans until 2002, the investment in PFI projects by the private sector is set to continue at an increased pace over the next years.

Taking into account the envisaged future expansion of PFI and making use of the experience already gathered, it is very important and timely to propose a conceptual framework for the PFI's Sustainable Competitive Advantage. With this framework government and private companies will have a sound empiric basis for future strategic decisions on whether or not to pursue the PFI route.

The goal of this research is therefore to create and justify a conceptual framework for the PFI's Sustainable Competitive Advantage.

The generic aims of this thesis that flow from the goal are as follows:

1 Has PFI proved to deliver better service and Value For Money (VFM) than the traditional forms of undertaking public projects?

2 Has PFI proved to provide an adequate framework for risk allocation between the private and public sectors?

3 Has PFI proved to be a competitive procurement tool?

4 Has PFI the adequate conditions in the macro economic and political environment to develop?

In order to examine these aims the following objectives have been developed:

1 Whole Life Cycle Risk Uncertainty Management model

2 Critical Success Factors model

3 Sustainable Competitive Advantage model

The remainder of this chapter describes the UK political environment and the main events related with the development of PFI. It's roots lie in the fundamental beliefs of the Monetarist Theories that were first put in practice by the Conservative Governments. The PFI concept is innovative in the sense that what the Government pays for is solely a service. This has permitted the PFI to extend its sector coverage to areas where concessions were traditionally not being used. Since then several developments have taken place, mainly setting up standard procedures.

Chapter 2 presents the research methodology, including the strategic framework for the research, the development of the research questions and a discussion on the use of the case study methodology to test and validate the models proposed.

Chapter 3 presents the underlying rationale as to why the UK Government introduced PFI. Although a national policy it must be analysed and integrated within the historic and economic background and in an international context as each state is a participant in the global economy.

Chapter 4 proposes a definition and conceptual framework for PFI applying the existing management models: Life cycle, value chain etc. In addition, based on the empiric data

from the research and recurring to business information sources and academic studies on PFI (still very limited), the chapter addresses important issues that emerged from the introduction of PFI.

Chapter 5 proposes a dynamic model of Whole Life Cycle Risk Uncertainty Management for PFI projects. It is a clear picture of how uncertainty progresses throughout the whole life cycle, and is comprehensive so as to avoid the wishful thinking attitude that might prevent the adoption of correct risk-management measures.

Chapter 6 proposes a conceptual model for the Critical Success Factors for a PFI. It is systemic and holistic and is based on the hierarchy and inter-relationships of the issues identified in PFI projects

Chapter 7 proposes and discusses the dynamic and iterative model for Sustainable Competitive Advantage in a PFI. This model aggregates the models on Risk Uncertainty Management (Chapter 5) Critical Success Factors (Chapter 6) and integrates them with the political and economic environment (Chapter 4).

Chapter 8 summarises the conclusions on the proposed models, the assessment of the research aims as well as the reasons for variability in projects within the international context and sector-wise. Included are also findings as to a viable role for the Small and Medium Enterprises, a set of recommendations for the public and private sectors and topics for future research work.

Chapter 9 presents the bibliographic references.

1.2 The Introduction of PFI

1.2.1 The Background of PFI

Next follows the chronology of the landmarks of PFI development. It starts with a brief description of the UK' political and economic framework that led to the emergence of PFI and proceeds indicating the main events in the UK and internationally.

1977: Redefinition of the Public Sector Borrowing Requirement (PSBR) – "*the amount of money the government needs to borrow to meet its spending plans*". In other words, it is the amount by which spending exceeds tax revenue. In recent times, it is also referred to as Public Sector Net Cash Requirement (PSNCR). Before 1997, all expenditure on nationalised industries and public services was charged against the PSBR. Post 1977, the focus was switched to the External Financing Limit (EFL) – a cash limit set aside for each department, which some argued, constrained the growth of nationalised industries and contributed to the recession.

1979: Election of the Conservative Government of Margaret Thatcher in May. Its economic policy was based on Monetarism, part of which philosophy is that, to reduce inflation the growth in money supply needs to be controlled. A strict policy of reducing public expenditure was put in place.

1981: In view of the widespread criticism of the EFL, a committee chaired by Sir William Ryrie examined the conditions under which nationalised industries should make use of the private capital markets. The Ryrie Rules set the principles for private funding of governmental projects:

> *"Decisions to provide funds for investment should be taken under conditions of fair competition with private sector borrowers... such projects should yield benefits in terms of improved efficiency... The use of private finance is justified if... it provides the most cost-effective solution... The risk of losses – unprotected by public guarantees – is a the heart of market disciplines"* (HM Treasury 1988 in Haque 1996).

The Rules stated that there was a need to compare private and publicly funded alternatives. They also made it clear that the private sector option would only proceed if it was more cost effective than the public sector option. Moreover, private funding should provide best VFM when compared to conventional public funding.

1989: The Ryrie Rules proved to be very difficult to implement, and *'were regularly criticised for being too restrictive and giving public bodies no incentive to seek privately funded solutions'* (Private Finance Panel 1995 in Broadbent 1999). The question then became, in the words of the then Chief Secretary to the Treasury, John Major *'How can we involve the private sector in building the infrastructure where the Government is the major provider...'*. The Ryrie Rules were partially withdrawn in 1989 and abandoned in 1992 with the launch of PFI.

Despite all criticisms the Ryrie Rules permitted the launch (Department of the Environment Transport and the Regions - DETR 1999) of major infrastructure projects like the Dartford Thurrock Crossing in April 1987 (£150 million), the Second Severn Crossing in April 1990 (£330 million) and the Birmingham Northern Relief Road in February 1992 (£300 million).

1.2.2 The Launch of PFI

1992: The Conservative Government of John Major was re-elected in May. The UK had joined the Exchange Rate Mechanism (ERM), a system of fixed interest rates, in 1990, an attempt to depoliticise economic policy-making and achieve automatic correction to inflation. However, the anti-inflationary discipline (Kerr 1998) of the ERM deepened the recession. Between 1990 and 1992 (although with a reduction in inflation) high interest rates, persistently slow economic growth, pressure on public spending, and loss of revenue intensified the fiscal crisis of the state and resulted in a large balance of payments deficit. The PSBR moved from -14% in 1988/89 to 36.5% in 1992/93. The second quarter of 1992 saw Britain's Gross Domestic Product (GDP) fall 3.6% from its 1990 level while other European Union (EU) nations experienced a rise of 2.8% on average. The balance of

payments continued to slide, recording a current account deficit of £13,680 million in 1992. From a financial deficit in 1990 of £2 billion, the Government ended 1992 with a deficit of £37.5 billion. The pound became a target in financial markets and Britain was out of the ERM in 1992. This forced the newly elected Government to focus on 'domestic' conditions to contain inflation. As such, new ways of reducing public expenditure and subordinating state activities to the logic of the market were sought.

The PFI was formally launched in the UK Autumn Statement (Broadbent 1999) of the then Chancellor of the Exchequer Norman Lamont. Against a background of recession the Chancellor set out to reorganise the framework of monetary policy (on the exit of the pound from the ERM), to control fiscal policy and limit public sector spending and to increase the growth rate of the economy. The later was seen to be best achieved by "*Pressing ahead with our policies on privatisation, deregulation, cutting out waste and keeping the tax burden of companies and individuals as low as we can*" (Norman Lamont, House of Commons Hansard (HCH), 12/11/92, column ©994 in Broadbent 1999).

> *"The PFI, like the earlier policies of privatisation and contracting-out, is based on a 'political rationality' that private sector enterprise and discipline can bring gains in efficiency and reduction in costs and is stimulated by the 'fundamental duty' of the Government - keeping inflation down and getting public finances back on the right track"* (HM Treasury 1998)

In this context, there was recognition of the continuing need for capital expenditure. Whilst the Chancellor sought to give some protection to the provision of capital from public resources a major theme was the development of the "*private financing of capital projects*" (Norman Lamont, HCH, 12/11/92, © 998 in Broadbent 1999).

Three developments were announced: Free-Standing Projects, Joint Ventures and DBFOs:

- **Free-Standing Projects:** Any privately financed project in the public sector that could be profitable should be allowed to proceed. The private sector is required to recover all costs through charges on the final (usually) private users of the service. The public sector plays a facilitating role but no public money is involved - for example, toll bridges.

- **Joint-Ventures** that allow a sensible transfer of risk to the private sector should be encouraged. The public sector contributes a subsidy to a project but the revenue comes principally from third parties. These projects have a positive cost benefit analysis, but would not be financially viable if funded by private finance alone - for example, urban regeneration schemes or congestion relief roads.
- **Design-Build-Finance-Operate (DBFO):** Leasing that permits good value for money and for risk to remain with the private sector, should also to be allowed. The private parties Designs, Builds, Finances and Operates the facilities and the public partner purchases the services

The fundamental requirements for PFI projects are:

- The public sector must secure VFM;
- There must be an appropriate transfer of risk to the private sector.

The transfer of risk to the private sector does not waive responsibility of the Government for service provision. As the National Audit Office (NAO 1999) clearly states in it's report *"Examining the value for money of deals under the PFI"*:

> *'The auditor should be aware that departments cannot transfer to the private sector the risk of political embarrassment or the risk to the delivery of their core business should the contractor fail to deliver their contracted services"*

The aim of the PFI is therefore to increase the flow of capital to projects against a background of restraint on public expenditure by utilising the private sector money and management skills. It is not expected that the public sector will be the sole beneficiary, the PFI is supposed to offer *'real benefits to the private sector in the form of increased business profit'* (DETR 1999).

Very importantly, key decisions for the PFI project are always with the public sector. This is different from turnkey projects were the owner retains the risk of viability of the project plus the risk of the operating and maintenance costs. Like

contracting-out and privatisation policies (Kerr 1998), the PFI represents a fundamental change in the focus of the public sector, away from being a direct provider to the public and towards becoming a procurer of services and a regulator. What makes PFI different (Table1.1) is that, unlike privatisation, the public sector retains a substantial role in PFI projects and, unlike contracting-out, the private sector provides the capital assets as well the services.

Table 1.1. Central Differences in Governmental Policies

	Ownership of assets by Private Sector	Service Provision by Private Sector	Private Sector ultimate responsibility for service provision
Privatisation	Yes	Yes	Yes
Contracting-out	No	Yes	No
Concession	In fixed term	Yes	No

A major difference between PFI and a traditional concession is that the government is no longer acquiring assets and providing for the services, but instead is only buying services. This simple concept has extended the sector coverage of the PFI, from being limited to infrastructure projects (like concessions) and allowed it to include other sectors like schools, accommodation, custodial services, hospitals, IT projects, etc.

PFI was also part of a much wider agenda of attempts to increase the efficiency of the public sector through the introduction of managerial change, and expertise drawn from the private sector. At one extreme, this has involved privatising key activities and organisations previously owned and managed by the public sector. In others, as with PFI, it has involved increasing levels of partnership with the private sector, although the government always has the ultimate responsibility for the delivery of a service.

In conclusion, PFI was a product of a set of pre-conditions and based on these a regulatory framework was established. It was useful for both the government and industry. The government didn't have funds to spend on infrastructure and PFI's capital expenditure is off-balance sheet so it reduces the PSBR. From the industry's side it ensured a steady flow of work and the need for efficiency was not

a new requisite. Design and Build procurement was already widespread (the cheapest was the winning bid) and outsourcing (more efficient) was already increasingly being used throughout the private sector.

1.2.3 Evolution of PFI

1993: The private sector continued to show little interest in investing capital into public projects. The new Chancellor, Kenneth Clark gave the PFI greater impetus by announcing, in the Autumn Statement that a new Private Finance Panel would be created. Its role would be

> *"...to encourage greater participation in the initiative by both the private and public sectors, to stimulate new ideas, to identify new areas of public sector activity where the private sector could get involved, and to seek solutions which might impede progress."* (Private Finance Panel 1995 in Broadbent 1999).

1994: In November in its Autumn Statement the Chancellor, Kenneth Clark ensured engagement with the private sector by making plain that the Treasury would not approve any capital project unless options to secure private finance had been explored. So it became mandatory that all capital projects in the public sector that require Treasury approval should explore private finance options.

1996: The Public Private Partnerships Program (4Ps) was launched on 11 April, 1996, by the Local Authority Associations of England and Wales. It aims to bring about increased investment in local services through PFI and other Private/Public sector Partnerships (PPPs). It will last until March 2001 (HM Treasury 1997c).

The PFI *'industry'* (Clarke 1996), by then comprised construction and engineering companies, hotel groups, and utility and facilities management companies, as well as finance houses, law firms, and accountants.

May 1997: Labour Government of Tony Blair is elected and continues the ongoing development of policies promising to reinvigorate PFI.

June 1997: First Bates Review on PFI resulted in the launch of the PFI Treasury Taskforce to replace the Private Finance Panel and to help build up PFI expertise in Government. It was established within the Treasury and consisted of a Policy Team, composed predominantly of civil servants, responsible for developing policy guidance on PFI, and a Projects Team of around a dozen highly skilled people from the private sector, who are available to help public sector bodies execute PFI deals. It had a limited life of 2 years. The intention was that at the end of this period, the level of expertise of the PFI functions within the Government would be sufficient to set up partnerships with the private sector without any continuing need for a central co-ordinating capability.

The Taskforce main aim was *'to be a driving force, in conjunction with spending departments, in bringing about PFI and other Public/Private Partnerships'*. The newly appointed Chief Executive, Adrian Montague, reported directly to the then Paymaster General (HM Treasury 1997a). The need for such a Taskforce was clearly stated by the Paymaster General Geoffrey Robinson in his speech welcoming the appointment of its members.

> *"Previously the lack of concentrated expertise, a proliferation of unprioritised projects and constant reinvention of the wheel used to stand in the way of success. The Taskforce is going to provide the assistance and impetus required to improve projects and deliver a sound basis for future business."* (HM Treasury 1997b).

One of the most important changes was the abolition by Geoffrey Robinson, of the rule that all projects had to be universally tested for private finance, which had created an enormous bottleneck with inappropriate projects.

November 1997: Partnerships for Prosperity was launched as an introductory guide to the reinvigorated PFI.

> *"It sets out clearly in one document, the Government support for PFI, the role of the new Treasury Private Finance Taskforce, fundamental policy principles, the procurement process, a list of key contacts and further reference areas."* (HM Treasury 1997c).

PPPs were introduced to the local authority sector without first ensuring that the necessary legal framework was in place. Consequently, the governing body or board members of the public sector entity could be at risk of acting outside their

powers, that is, *Ultra Vires*. Local Authorities Regulations 1997 were published to correct the problems related with Capital Finance (Brown 1999). Also, the Local Government Act 1997 established a certification process for qualifying PPPs contracts that in effect overrides public and private law challenges to the contract ensuring agreed termination payments. Legislation was also published concerning the National Health Services Trusts empowering them to establish PFI contracts.

1998: For several years there has been significant disagreement (Brown 1999) between the Accounting Standards Board (ASB) and the UK Treasury over the accounting treatment of PPPs. So far the views of the ASB have prevailed. This has resulted in some projects remaining on the public sector's balance sheet and therefore the UK Government is considering alternatives to private sector finance, such as public sector equity funds and infrastructure bonds. Under the current accounting practices set by the Financial Reporting Standard 5 (FRS5), contracts for services are not capitalised. As a PFI is a contract for services, it falls into this category. However where a substantial property underpinned the services provided under a PFI contract, it was necessary to determine who had the asset. The clarification of this issue led to the publication of an amendment to FRS5 '*Reporting the Substance of Transactions: Private Finance Initiative and Similar Contracts*" by the UK's ASB in September 1998.

The efforts to promote PFI deals started to produce results. In October, the then Paymaster General Geoffrey Robinson announced a second *tranche* of a further 30 significant PFI projects. Speaking about the second list he said:

> *"The Taskforce has been up and running for one year now and in time 52 significant projects have been signed worth nearly £4 billion... The Taskforce has made real progress in standardising PFI deals and it is now starting to bring dividends. Shorter completion times and lower transaction cost mean better value for money for the public sector."* (HM Treasury Taskforce 1998).

Between May 1, 1997 and January 7, 1999 there has been over £3,800 million worth of PFI projects signed. Table 1.2 summarises the main features of PFI deals signed until 1998 by sector (HM Treasury Taskforce 1999).

Table 1.2. PFI Contracts Signed Prior to 1998

Sector	Type of Project	Contract Term (years)	Typical Transaction Size (£ million)
Accommodation	Refurbish/Relocate Government Offices	20	70 – 1,500
Railways	New light rail and high speed rail networks	30	90 - 3,000
Roads	Individual or linked new build and road widening schemes	30	50 - 300
Prisons	New Prisons	25-27	35 – 120
Schools	New build and refurbishment of schools	25 – 27	15 – 150
Defence	Equipment supply, maintenance and property new build and refurbishment	15 –25	15 – 1,500
Healthcare	New hospitals	30	70 – 300
Water	New-upgrade water treatment plants	25-40	10 - 80

March 1999: Second Bates Review examined the progress made by the Government in the delivery of PFI and PPPs and recommended changes to existing arrangements intended to improve further the Government's approach to PPPs. It concluded that although the creation of the Taskforce has been successful in improving the public sector's performance, there still remains a shortage in essential skills required to set up effective partnerships with the private sector. In particular it refers to a lack in deal-making skills in departmental private finance units and concluded that a longer-term requirement for central expertise remained. In particular, Bates pointed to the following areas of weakness: strategic planning; project management; negotiation skills; financial disciplines and management of long-term contracts. It recommended that, following the expiry of the Taskforce a new public private partnership should be set up (HM Treasury Taskforce 1999).

Gershon Report – This report was published in conjunction with the Bates review and dealt with the issues of Civil Procurement within the UK Government. Among its conclusions, and relevant to PFI procurement is that more emphasis should be given on whole life cycle costs and integrated supply chains for all procurement processes.

June 1999: The Treasury Taskforce published the guidance *How to Account for PFI Transactions*. The then Chief Secretary of the Treasury Alan Milburn said:

> *"The Government's new guidelines will make PFI work more effectively and more fairly. This will help deliver higher levels of investment to*

modernise Britain's key public services such as the National Health Service (NHS).... Already this Government has signed 140 deals worth £4.7 billion since May 1997 including the largest programme of new hospital building in the history of the NHS.....By providing a platform of certainty, the new guidance will help the PFI continue to grow." (HM Treasury Taskforce 1999a).

July 1999: Announcement of Partnerships UK (PUK), a PPP, as a successor of the Taskforce, in line with the recommendations of the Second Bates review. It will act as a project manager for PFI deals, providing expert advisory and implementation skills. It will address the key weakness in the current PFI/PPP process. It will take the form of a partnership, with the private sector taking a majority stake in a joint venture with central Government and with a Board Chairman drawn from the private sector. A steering group will be formed to oversee the development of its business case, to consider governance issues, and to prepare for the raising of private sector capital, which is not expected to take place before March 2000 (HM Treasury Taskforce 1999c).

July 1999: PFI Standard Contract launched. These contract guidelines ensure that future PFI contracts across different public services will be able to follow a consistent approach by incorporating standard conditions (HM Treasury Taskforce 1999b). All parties involved in PFI welcomed standardised documentation. They saw it as a measure to increase the efficiency of the stages prior to the signing of the contract, lowering negotiation times and leading to lower bidding costs.

August 1999: The NAO published the report by the Comptroller and Auditor General *Examining the value for money of deals under the Private Finance Initiative.* The report describes the analytical framework developed by NAO to analyse PFI deals. It seeks to cover comprehensively the key value for money issues. The principles its audits are based on are:

- Setting clear objectives;
- Applying the proper procurement process;
- Selecting the best available deal;
- Ensuring that the deal makes sense.

June 2000: The first tranche of PFI and PPPs projects under Partnerships UK is announced. According to Andrew Smith, Chief Secretary to the Treasury

> *"Partnerships UK has got together a first rate team who are capable of delivering the Government's vision on public private partnerships over the next decade. The private sector skills they offer will help in the drive to deliver improved public services..."* (Partnerships UK 2000).

February 2001: Partnerships UK announced that it seeks private investors for a 51% stake in its expected capital base of £45 million. The remaining 49% will be retained by the public sector (Partnerships UK 2001a).

April 2001: Partnerships UK has successfully raised private funding for the 51% stake. The sale was 30% oversubscribed which is a clear indication of the market interest. Within the main investors are banks, financial institutions and corporate companies (Partnerships UK 2001b).

December 2001: Partnerships UK has announced the publication of *'A Guidance note for Public Sector Bodies forming Joint Venture Companies with the Private Sector'*. James Stewart, Chief Executive Officer of PUK said:

> *"The new guidance will equip the public sector with the knowledge to make a success of joint ventures, and thereby increase the number of wider market transactions. It complements the support that Partnerships UK can bring to bear on a project"* (Partnerships UK 2001c).

1.2.4 Future Prospects

PFI has spread to a great number of sectors within the UK and this trend of increasing use of PFI for government projects is set to continue given prevailing economic conditions in the UK. Up to September 30, 2001, about 450 PFI projects were signed, with a capital value of more than £20 billion (Financial Times 2002).

According to the UK Government's 2001 Budget, public finances in the UK in the fiscal year of 1999-2000 showed a budget with over 2% of GDP surplus. This compares with an average deficit of over 4% of GDP between 1991-92 and 1996-97. Net borrowing, which peaked at almost 8% of GDP in 1994, has also moved into surplus. Net debt, which doubled over the first half of the 1990s, has been falling as a percentage of GDP since mid-1997. Net borrowing remains low, despite higher public investment and the debt burden continues to fall. Both the budget deficit and debt burden were well within the Maastricht reference levels in calendar year 1998. It is expected to continue to meet

the Maastricht criteria. In the face of these good results the ongoing economic and fiscal policies are expected to be pursued.

In 1999 and over the next three years (Wilson 1999), a high proportion of public expenditure investment in the UK will be financed privately. According to HM Treasury, from 1999-00 to 2001-02 around £11 billion, and from 2000-01 to 2003-04 some £13 billion of new investment is expected as a result of PFI. Also Table 1.3 shows that investment by the private sector under the PFI is expected to be equivalent to 16% of the total public sector investment (public sector gross investment) over the three year (1999-2002) period covered by the Comprehensive Spending Review (CSR): New Spending Plans 1999-2002 (HM Treasury 1998). The CSR sets out the plans to allocate expenditure between spending programmes that will help to secure the Government's key objectives.

Table 1.3. Forecasted Investment in Public Projects by the Public and Private Sector for 1999-2002

(£ billion)	Public Sector Gross Investment	Public Sector Net Investment (PSNI)	PSNI as per cent GDP %	Additional Investment (PFI/PPP)
1998/99	18.0	3.4	0.4	2.2
1999/2000	20.3	5.5	0.6	3.8
2000/2001	22.7	7.5	0.8	4.1
2001/2002	25.4	9.6	1.0	3.0

Source. HM Treasury 1999.

The future of PFI in the UK seems certain. In the words of Chief Secretary of the Treasury, Alan Milburn, announcing the launch of Partnerships UK:

> *"The Government is modernising how we do business to provide a better deal for taxpayers and public services alike. Partnerships UK will provide the expertise of the private sector. We have turned the PFI around. Ending universal testing, providing certainty through new accounting treatment, offering staff a fairer deal and standardising contracts have reformed the PFI... The challenge now is to use the new PFI to help drive forward the Government's modernisation programme of our public services. We want to expand the PFI especially in sectors where it has not worked before. Partnerships UK will help deliver that. It will help get more PFI deals done more quickly...It will have world class project management skills to help deliver world class public services."* (HM Treasury Taskforce 1999c).

1.2.5 International Expansion

The UK's PFI experience has been exported to several regions. Geoffrey Robinson, in a speech in April 1998, announced that the Treasury had received delegations for consultation about PFI from several countries such as Australia, Brazil, China, Japan, South Africa, and from regions such as East Europe and the Middle East and European countries like France, the Netherlands and Spain. Indeed, in Europe (Warner 1998, 1999) PPPs are increasingly common induced by the:

- Development of the single European Market that gave rise to the realisation of the need for substantially increased investment in infrastructure to achieve its objectives;
- The Economic and Monetary Union (EMU) that has brought a series of disciplines and reforms of public funding policies to meet economic and monetary convergence.

The European PPPs in general follow the UK's model, with a risk sharing approach to the project although often without taking the ownership of the asset. Several examples of PPPs outside the UK are:

- Netherlands: Dutch high-speed rail link between Amsterdam and the Dutch/Belgian border. From the border, it will link to Brussels. The Netherlands has a treaty with Belgium that commits each country to completing its respective part by 2005. On completion, the private sector is to take over the civil side and have responsibility for operating and maintaining the entire railway. Under the contract, a performance fee based on a target level of availability of the railway service is to be paid;
- Portugal: This is the country where PPP deals are more similar to the UK's model. For example, the Vasco da Gama Bridge that was inaugurated in June 1998, and the Tapada IPP power station. As of 2001 bidding process was well advanced for the SCUTs (shadow toll roads), which resemble the UK's DBFOs. This consists of seven toll road projects with a total value of approximately $5.5 billion;
- Greece has probably the biggest programme concession projects after the UK. It has undertaken the Spata Airway, the Essi Motorway and the Rion

Antirion Bridge. Under a structural funding agreement with the EU in 1998, Greece will benefit from an investment programme of $49.5 billion for 2000-2006 to be co-financed by the EU and the Greek Government. Most of the investment is to be directed to infrastructure projects. With the Olympic Games to be hosted in Athens in 2004, a priority is to establish privately financed concessions for projects such as the Olympic Village and the Olympic Stadium;

- Italy: Under their national law implementing the EU work directive, it includes the principles of project finance. A PFI panel is being set in place. There are already a number of PFI projects under preparation, but there is as yet no authority to proceed with them;
- Finland has a shadow toll road and is considering extending the experience to schools;
- Ireland is considering the use of PFI in several areas;
- Outside Europe, Japan has been studying the PFI concept. The Osaka Stock Exchange has established the first PFI market in September 1999 and in March 2002 Junichiro Koizumi, the prime minister, has considered PFI an important part of the structural reform for revitalising the economy (Financial Times 2002). In South Africa, prison PPP projects are underway and road projects are also to be considered.
- In Australia great effort has been done on developing both a clear guidance and promoting the real understanding on how public private partnerships function. They realised that the introduction of PFI/PPP schemes is a fundamental cultural change.

Chapter 1 introduced PFI and its economic and political context. The next chapter presents the research methodology followed to address the research aims.

CHAPTER 2

Research Methodology

2.1 Introduction

This chapter describes the methodology developed for this research. It starts by defining the methodological approach, the strategic framework. Pursues discussing the research purpose development of the theoretically derived models. Lastly it discusses the research design explaining the reasons for its choice and pursues examining data collection, analysis and validation.

2.1.1 Methodological Approach

A PhD thesis aims to advance science and knowledge '*To get the answers to the why questions, to find the explanations, relationships, generalisations and theories that can provide answers that develop the understanding, always involving decision making and policy formulation*' (Phillips 1993).

In a research methodology three types of questions are always involved: the *Why* questions, the *What* questions that are the information gathering process and the *How* questions stating exactly which procedures were adopted during the various stages of the thesis, in brief:

- ***What I am going to do, or the Research Purpose and its Validation*** – *To define the research questions* that state the basic directions for the study. The answers to the questions are based on an intelligence-gathering process: a literature review and exploratory research are usually undertaken to develop the research questions.

1990) and the basic direction for future actions. It allows isolated tasks and activities to fit together; it moves separate efforts toward a common integrated purpose and provides a clear guidance for the research, and assures that the objectives are met. The strategic framework of the current research is inevitably interlinked with the macroeconomic environment of the countries where PFI was (and is) used as a procurement tool. The research feeds on this framework to find its strategic objectives, or questions to be answered.

In 1992, the UK Government introduced the PFI to capture private funds for public projects. Simultaneously, in the EU, after signing the Maastrich Treaty, Governments had to control debt and consequently public funds to undertake governmental projects were limited. PPP/PFI was one solution to overcome these constraints and currently these types of projects are increasingly common in Europe and other regions.

In recent years PFI already accounts for a very significant part of the UK Government investment. According to the CSR, over the three-year period 1999-2002, it is expected that PFI projects will reach 16 percent of the total public sector gross investment. PFI has spread to a great number of sectors within the UK: Roads and Bridges, Prisons, Hospitals, Government Office Accommodation, Defence, Tolled Motorways, Trams and Metro, Street Lighting, Court Buildings, Schools, Universities, IT Projects, Water and Sewerage Systems, and also Social Housing and Regeneration, City Centre Traffic Management Schemes and Multi-sector projects.

In the UK, PFI's impact has been felt in both the public and private sectors. Among the most relevant consequences are:

- changing the role of the Public Sector in the procurement process, from service provider to service specifier;
- a change in the way the construction industry is managed. There is now the widespread practice of management tools like: whole life cycle costing, risk management and benchmarking;
- the development of innovations in the capital markets sectors, like the development of new forms of bond issuance;
- the emergence of the notion of Corporate PFI. This derives from the concept underlying in PFI of service provision and is an extension of its applicability to the private sector's own projects.

In a PFI project the private service provider has to manage and make the project profitable during the whole life cycle. This means it is very important to pursue Whole Life Cycle Cost savings to increase the profitability of the private funds invested in the project. These savings are in turn, a source of VFM for the public sector, guaranteeing a better allocation of the taxpayer's money. Not the least important, the general public gets, in theory, a better service than the one that the public sector could have provided.

Taking into account the envisaged future expansion of PFI and making use of the experience already gathered, it is very important and timely to assess the sustainability of the competitiveness of PFI. Both government and private companies will have a sound basis for future strategic decisions on whether or not to pursue the PFI route.

Having established this dissertation strategic framework and methodological approach, the next section describes the research purpose.

2.1.3 Research Purpose

The research was conducted in two main stages: The exploratory research that started by defining the research questions, and the theoretical frameworks developments, or models that answered these questions, and second the confirmatory research stage to test and validate the models using a case study approach.

The next sections describe how the study was conducted to develop the research aims and objectives.

2.1.3.1 Exploratory Research

The research aims and objectives development was based on the data collected in an extensive literature review and exploratory fieldwork research. The information sought after was first related to the PFI development in the UK. How were the PFI projects performing? What were the main reasons for success and failure in the bidding and operational stages? The same issues were also covered in Portugal where the PFI model has been adopted for some large governmental projects. The issues that arose were related with project finance and risk management issues. Project finance is a financing technique that has been in use for a long time in concessions and PFI financing structure is similar.

The most important feature that emerged was the lack of a holistic long-term approach to PFI. These projects develop long term and a systematic and continuous approach to risk management is missing. Due to the importance that PFI has, and its future prospects, within the UK Government procurement it is critical to assess its current and long-term competitiveness.

The research was systematised at three levels: the project in itself as a unit, its comparison with other procurement models and its sustainability, to get a holistic long-term view of PFI. The three research levels are:

- *The PFI project in itself* – Focusing on the issues encountered over the whole life cycle in the PFI market;
- *PFI Competitiveness* - The comparison with other procurement models and its relation with other forms of procurement, aiming at evaluating whether the PFI procurement model is more competitive than other traditional procurement models, i.e., does PFI bring any advantages?;
- *PFI Long-Term Sustainability* - The dynamic evaluation over the long-term for PFI was analysed aimed at identifying the necessary pre-conditions for its long-term competitiveness sustainability. More precisely, if PFI is currently a competitive procurement model what are the factors that assure that it will continue to be competitive in the future.

During the first stage of the research, it was found necessary to define what risk and uncertainty meant. The two concepts are very often interchanged, yet they refer to different, although very closely related concepts. In the following chapters proposed risk and uncertainty definitions will be presented and thereafter both terms will be used accurately. For the current description of research methodology, it was found more adequate (and simpler) to use only the term risk, as significant correctness will not be lost.

During the exploratory research, several constraints to the development of the study were encountered. The main ones were:

- *Limited academic bibliography* - As it is a new model there are very few research and academic studies on this area. The bibliography for this theme ends up with a great weight in specialised economic journals (not academic) like Financial Times, etc.;
- *The bulk of the bibliography that exists is mainly focused in construction and financial risk*, or project finance issues, lacking information on bidding, and Operation/Management risks;
- PFI has a typical life cycle of 20-30 years and *the great majority of projects have*

been operational only for a few years so there is very little (or no) experience of the operation/maintenance stage;

- *Limited regional coverage* - The interviews were done in Portugal and UK. It would have been useful to assess how PFI is performing in other regions and/or organisational cultures;
- *Portugal has very few projects* of this nature and although using the generic PFI model, the political commitment to it is not the same as in the UK.

Also, during the exploratory research and interviews it was not possible to take up several issues:

- The PFI market currently comprises a great number of different sectors with very different characteristics. Nonetheless, it would have been useful to examine the possibility of dividing the market using segmentation variables, other than the sector itself, like technology, social visibility, etc. A possible further line of research could be to examine the newfound segments and assess if the project's risk level is correlated with the market segments, that is, if the risk level is correlated with any of the segmentation variables. This was not possible because not enough sectors were studied in detail, but this research line can be a post-doctoral development;
- Interviews with governmental authorities are few relative to those done with persons of the private sector. It was not possible to obtain several interviews although solicited. The public sector view is largely based on the available bibliography, and other documentation.

2.1.3.2 Development of Research Aims and Objectives

Based on the preliminary research, the research aims needed to achieve the goal for the PhD thesis '*Sustainable Competitive Advantage in PFI - A systematic and holistic approach to identify the CSF in Risk Management in PFI, taking into account the whole life cycle*' have been defined as:

Research Aims

1. *Has PFI proved to deliver a better service and VFM than the traditional forms of undertaking public projects?*
2. *Has PFI proved to provide an adequate framework for risk allocation between the private and public sectors?*
3. *Has PFI proved to be a competitive procurement tool?*
4. *Has PFI the adequate conditions in the macro economic and political environment to develop?*

The research objectives needed to answer the aims have been defined as:

Research Objectives

1. *What is the model for sustainable competitive advantage in PFI?*
2. *What is the model for whole life cycle risk management in PFI?*
3. *What are the Critical Success Factors in a PFI?*

2.2 Development of the theoretical frameworks, or Models

The models are the theoretical developments that PhD research level aims at. The models based in the intelligence gathered provide an answer to the research questions, thus being the theories, generalisations or the scientific advances that are the main contribution of a PhD. The models (Phillips 1993) are the answers to the *why* questions and always involve explanations, relationships, comparisons, predictions, generalisations and theories. As mentioned before, in a PhD three questions are always present: The *why*, the *what* and the *how* questions. The advance of science is pursued with the answers to the *why* questions in order to have theoretical advances; the *what* questions derive from the intelligence gathering process and its output are the research questions; the answers to the *how* questions summon up the procedures adopted.

A summary description of the models developed to answer the three research objectives described in 2.1.3.2 follows. For each model, the corresponding *why* question(s) whose answer is the justification that clarifies the underlying relationships and generalisations considered when the models were conceptualised, is also presented.

2.2.1 Sustainable Competitive Advantage Model

- Research Objective

  What is the model for sustainable competitive advantage in PFI?

  Developed Model

  Competitiveness Sustainability Model

  Justification

  What are the CSFs in a PFI? And why?

  What is the Risk Uncertainty Management model?

To evaluate the competitive advantage the **'4Blocks' Model** (Hill & Jones 1995) was utilised. It consists of four Dimensions or Generic Factors: Efficiency, Innovation, Quality and Attention to the Client. These are the main blocks to build a company's competitive advantage vis-à-vis its competitors. In turn, these factors are derived from the company's competences, resources and capabilities. This model was adapted to assess the competitiveness not of a company but of PFI. The rationale was that PFI is equivalent to a company with a pre-defined life span. This assumption is indeed very close to reality, as every PFI requires the setting-up of a regular company – a Special Purpose Vehicle (SPV) that executes the project.

The assumption was that if PFI brings in improvements in efficiency, innovation, quality and attention to the client's needs, then it is more competitive than other methods of government procurement.

The evaluation of the Factors was done recurring to secondary data, mainly documentary and primary data from interviews. The interviews were with a panel of experts of selected functional areas, and within the case studies developed. All the Factors can be applied to a wide number of issues. The evaluation tried to be as comprehensive as possible but due to the study's constraints in scope and time, it is possible that some issues were missed. Nevertheless, the research undertaken can provide sound conclusions on the models competitiveness based on identified improvements in

efficiency, quality, innovation and attention to the client, although with limitations that must be acknowledged.

If PFI proves to be a better model (more competitive) than the traditional methods of government procurement, the next step is the evaluation of its sustainability, i.e., what are the factors that render the PFI model susceptible to be used in the long term. The key issue is: How to avoid failure? Research suggests that long-term failure can be mitigated by continuous attention to what originated the competitive advantage: Was it increases in Efficiency? Improving quality? Does innovation still play an important part? What are the client's needs?

The research identified three areas that must be addressed to secure the sustainability of the competitive advantage:

- Political, social and economic environment that favours the use of private capital and innovation;
- Risk Uncertainty Management to improve mainly efficiency and efficacy;
- Critical Success Factors (CSFs) to ensure success acting on all four factors of competitive advantage.

These areas are closely interrelated and overlap in many issues. After consideration of the entire context of the study, and to accomplish the main research a model for the Sustainable Competitive Advantage (SCA) of PFI was conceptualised and proposed. It is our thesis that if PFI develops within an adequate environment (seen as a pre-condition to success) and applies the models of risk uncertainty management and critical success it will meet all the conditions to develop a sustainable competitive advantage.

The SCA model (Figure 2.1) must be dynamic and iterative and integrate:

- An adequate political, social and economic environment;
- The Whole Life Cycle Risk Uncertainty Management model (WLCRUM) proposed in the current research;
- The CSFs model proposed in the current research.

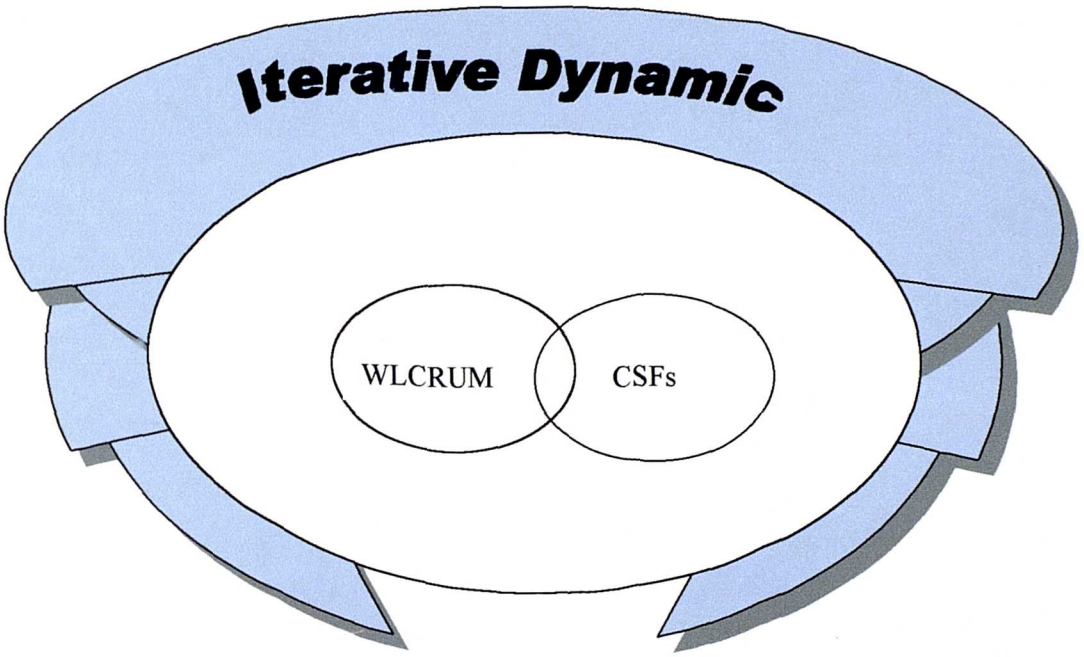


Figure 2.1. Proposed Conceptual Framework for the Sustainable Competitive Advantage of PFI.

The next sections present and describe the two sub-models on Risk Uncertainty and CSF that will be developed on Chapter 5 and 6. The Political social and economic framework will be addressed in Chapter 4.

2.2.1.1 PFI Risk Uncertainty Management Model for the Whole Life Cycle

- Research Objective:

What is the model for the whole life cycle risk uncertainty management in PFI?

Developed Model

PFI Risk Uncertainty Management Model for the Whole Life Cycle

Justification

Why the proposed model for PFI' risk management truthfully describes and quantifies uncertainty over the whole life cycle?

A PFI project is complex involving several types of risk throughout all stages of its life cycle. A model for the WLCRUM was developed including all the global risks, like financial, construction, operation and management (O/M), environment, and social, etc. The model's main innovative feature is that it describes how uncertainty of each risk type progresses and evolves throughout the whole life cycle.

The quantification of the WLCRUM model is next step. For each project it is then possible to have its risk level characterised by a numeric factor thus enabling the risk ranking of projects. MatLab© 5.3[2] was the software tool used to analyse the WLCRUM. For each type of risk it computes the linear function that describes the existing data points, and calculates the area beneath the line. If instead of singular points it is a smooth line that describes the uncertainty, the application calculates the best-fit line by interpolation and subsequently the area beneath the line. The value of the area is the quantum or value or uncertainty for each risk. The project's total uncertainty is obtained adding the various risk uncertainties (that is, adding the various areas). The data is normalised to enable the comparison between risks and between projects. There are still limitations with the calculations. The software available doesn't calculate areas for smooth lines when applying fuzzy logic, which is more appropriate to the type of data

obtained that is based on people's perceptions. Ayyub and Gupta (1994) present a good review on uncertainty modelling including the application of fuzzy logic. Other methods rely on the Monte Carlo simulation (Vose 2000) with its corresponding probabilities and regressions, requiring precise number and therefore not so well adapted to the type of empiric data of the current research.

This methodology is also more adapted to project risk ranking as other methods developed (Baccarini 2001) were based on scores assigned to risk factors and didn't take into account the whole life cycle developments.

The WLCRUM risk scale can also be used as a basis for strategic decisions: For example, it would be for: Senior Management a Decision Support System to assess the risk in long-term projects, Project Managers a tool to quantify and control the risk (to rethink the 'real life' factors that influence risk and make the necessary modifications, or adjustments to reduce the risk level of a project), and to Researchers a basis to develop Fuzzy models for Long Term Risk Assessment in PFI or other projects that develop throughout time.

[2] MATLAB is a high-performance language for technical computing. It integrates computation, visualization, and programming.

2.2.1.2 PFI Critical Success Factors

- Research Objective:

  What are the Critical Success Factors in PFI?

  Developed Model

  Critical Success Factors in PFI

  Justification

  Why the proposed model for CSF truthfully describes the factors for success in a PFI?

The CSFs were determined using the Cognitive Map (Eden 1988 , Eden & Ackerman 1998, Ackerman, Eden & Cropper 1992) technique. The principle is that you work with the ideas, see how they relate and influence one another. Also the logic of arguments or lines of reasoning are clearly represented in the map as each one is linked to other by arrows (Eden 1998) that indicate *'may lead to'*, *'has implications for'*, or *'supports'* – moving up the arrow, or *'is supported by'* when moving down the arrow.

A cognitive map represents the individual thinking and perception of an issue. When several individual maps are merged into one it ceases to be the representation of individual thinking and it provides the aggregated view of a representative group. A selected group of PFI stakeholders were interviewed and the resulting map illustrates the shared understanding of the development of a PFI project. The PFI map becomes a holistic and systemic view of all the content and context (links around) of all the concepts (or ideas) involved in a PFI, i.e., the issues, their relationships and how they fit together in a hierarchical manner. The data from the aggregated interviews was analysed using Decision Explorer qualitative data analysis software that helps to identify relationships (Banxia 2001) between different ideas and perspectives that might be expressed about any subject.

Similar techniques are Mind Map (Buzan 1993) and Concept Map (Novak 1993) but there are important differences that justify the choice made. Mind Mapping starts with one central concept (idea) and all the links depart from this central idea; which is not adequate as it was important to capture all possible issues avoiding all preconceived ideas about the centrality of the issues. Concept maps permits the free development of ideas departing from several focuses but lacks the ability to establish causal relationships between the concepts which is essential to create an hierarchy of concepts permitting the assessment of goal(s) and of the issues that *'may lead'* to achieving those goals. In concept maps the links between concepts are merely characterized with descriptions, identifying the association between concepts. It is only descriptive, no cause-effect (causal) relationship can be recognized.

Existing alternative methodologies are based on surveys and ranking of factors by expert panels. A good review can be found in Chua (1999). These methodologies miss the relationships and influences between the factors. Making it more likely that some factors are missing since their reasoning is not checked, or that others overlap, being different terminologies for the same concept. The usage of Cognitive Map for the CSF determination is an innovative proposal of the current research.

Decision Explorer ©1997-20013 was the software tool used to analyse the PFI Aggregate Cognitive Map

The next section is the answer to the *How* question. It describes the procedures adopted from the first stages of exploratory research to the validation of results by case study analysis. Included is a brief discussion on the theoretical framework for the use of case studies, qualitative data, as well as its validity and reliability.

[3] Banxia® Software Ltd.

2.3 Research Design

2.3.1 Empirical Study

The approach to the research design was iterative and took into account the macroeconomic strategic framework in which PFI developed. In the exploratory research, focused interviews (Robson 1999) were conducted with a panel of selected experts, both in the UK and in Portugal. The interviews were focused, giving plenty of freedom to the interviewee but conducting his/her reasoning to specific themes, like CSFs, Risk Management, the relations between the parties in the Bidding stage (their main area of expertise) and focusing on the long-term issues like the operation/maintenance stages in PFI.

The interviewee's expertise was horizontal, i.e., being part of a functional area, project management, financial, etc but all had a wide cross-experience over several projects and/or sectors. This was judged appropriate for this stage of the research that required a systemic view of PFI.

The experts were chosen because of their involvement in several PFI projects in different sectors, and on successful and unsuccessful bids. In this way, it was possible to profit from their overall experience and have more insight than with the in-depth study of only one or two PFI projects. Comparisons could be made and conclusions taken based on a much larger number of projects making use of different points of view.

There were different sets of data collected:

- Focused interviews in the preliminary research;
- Semi-structured interviews within the cases studies;
- Documentary data from the companies and specialised press;
- Bibliographic research on related themes and contexts like concessions, project finance and risk management.

From all interviews there was a summarised and written report, already including comments and interpretations

The literature review covered all the bibliographic databases that were available at the universities – Salford and IST, plus books, theses and journals on risk management, project finance and construction management. The two most important databases from those used were Proquest and Bids in the UK. Throughout the study there was extensive recourse to web based research using various search engines. This has proved to be an invaluable source of references both academic and non-academic. Amongst the search engines used Lycos, Google, Yahoo and Sapo proved to be the most useful.

The exploratory research was conducted by focused and relatively unstructured interviews (Robson 1999) with a panel of experts. In these interviews, the order of questions is not fixed and the interviewer provides the guidance for specific topics. It allows people's views to emerge providing insight of the important aspects, their meaning and the effects on those involved. The experts were from the various areas involved in PFI – construction companies, facilities management companies, financiers, and insurers.

For the case studies, a Case Study Protocol was developed (Annex I) trying to cover all the relevant issues and maintain the same analytical and descriptive structure throughout all case studies. One of the most important sections is the last – Key Learning Points, or if preferred, the Key Lessons that the case provided. The development of the Key Lessons required the researcher's insight, feeling, personal interpretation and judgement. An Interview Guide (attached) was developed, and included in the protocol, to provide structure to the data collected; questions were open ended so that interviewees could develop their own reasoning, insight and evolve to issues that the researcher had no prior knowledge. The more structured approach in this second set of interviews facilitated the analysis and permitted more accurate comparisons between cases.

The protocol laying out a set of procedures for the study, together with the case study's records (field observations, interviews, archival material, etc.) provides the necessary means for reanalysis (or external inspections) thus ensuring the stud's repeatability or reliability.

As expected, the most important, and interesting, data source were the interviews with project participants. The information was completed recurring to all other available information source, like project documentation. The Protocol intends to cover all the

relevant issues in a PFI project, but for some case studies it was not possible to collect all the information to make the case fully complete. Nevertheless, the missing information was not considered to be relevant for the key learning points of those particular case studies, and it would be too time consuming if not impossible to obtain it due, in many instances, to data confidentiality.

The possibility of respondent bias was controlled by using a multi-interview approach, obtaining several perspectives for the same issues interviewing persons of various areas within a PFI: private and public sectors, financial, operational, etc.

The Cognitive Map for the CSF was presented to successive interviewees always incorporating the issues of previous interviews. The interview technique was based on the one described by Rosenhead (2001). The interviewees usually had no previous knowledge of the technique, but after a brief introduction and initial guidance on how the issues were related, the interviewee would be confident to provide his comments and insights, adding new issues (concepts) and relations or making eventual corrections to the map. During the interview the model was explained interactively so that possible misunderstandings were checked. This procedure also ensures that questions are derived from the interview data not from a tight set of pre-prepared questions.

The data from the interviews was complemented, and checked by documentary data from the companies and other public sources.

2.3.1.1 The Role of Interviews

According to Bullen & Rockart (1981) all good managers have implicit (or heuristics[4]) knowledge of the CSFs, most often subconsciously. In addition, these factors are very subjective. The task of the researcher is to make those factors explicit and consistent in a logic and hierarchical way. Considerable preparation and skills are required to perform this task; a key skill is good interviewing technique. Interviews are quick, interactive,

[4] *Heuristics* - rules of thumb that usually lead to the correct solution but that are not guaranteed to work all of the time.

gaining insight in the empiric knowledge of the interviewee. It captures not the way he thinks, but how. It permits to watch for relations and question them.

The process of building the map with the interviewee itself is a good method to construct an effective interview. It helps to put forward the right questions and clarify the issues. The interviewer (Eden 1998) can miss many of subtle but important parts of an interview like the non-verbal clues, which very often are critical. Not building the map during the interview can also result in maps with missing links as this lack was not identified during the interview and questioned. In this case, the map was first built from the preliminary research and it was presented in all interviews being successively refined.

Interviews started with gathering general overviews, and it was after this that the interviewer would follow with predefined questions (interview guide) and with others that derived from this first general overview where issues that come up sometimes were not from the interviewer's knowledge. Interviews typically lasted between 1h30 to 2h. They were not taped as very often it constrains the interviewee.

An interview is very often a unique opportunity that has to be fully capitalized making full use of the interviewee time and knowledge.

Pre-interview preparation was done based on the preliminary research and available documentary data on the projects/sectors in analysis. When several interviews for the individual case studies were done the information gathered was always incorporated in this preliminary phase of subsequent interview preparation.

2.3.1.2 Problems with Interviews

Possible interviewer and interviewee bias - Especially with non-structured or semi-structured interviews it is very possible for the existence of interviewer bias. It is necessary to carefully analyse the results of the interview to eliminate or minimise this problem. Considerable experience and critical analysis is required.

As one goes down from top management to the operational level, it is clear that the interviewees tend to focus only, or primarily on the issues that affect their own functional area. In this case the first interviews were done mainly with people in the financial area

and the map was naturally focused in this area, it was only when the range of competences was enlarged that the resulting map started to show the systemic nature of PFI. People tend not to attribute any importance to issues outside their area of activity. Only top management, or project managers, can fully grasp the wholeness of the PFI project. It was found, that several interviewees, after reviewing the full map, were surprised by the number, characteristics and inter-relationships of the issues that come up.

The next sections describe the methodology used to develop and validate the theoretically derived models of the Risk Uncertainty Management and Sustainable Competitive Advantage of PFI models. The main concern was to choose a methodology based on the nature of the problems addressed. The methodological approach and the reasons for the choices made is also included.

2.3.2 Development of the Theoretical Framework (theoretically derived models)

The conceptualisation of the models, based upon the critical analysis of the exploratory research and the literature review, permitted the development of Sustainable Competitive Advantage and Risk Uncertainty Management (and Uncertainty throughout the whole life cycle) models in PFI projects. Ancillary analytical techniques were also used: Cognitive Mapping for the CSFs assessment, and MatLab for the semi-quantification of the Risk Management Model

2.3.3 Validation and Reliability

The methodology used for the validation of the developed models is largely based in qualitative data and case study analysis. The next sections begin by discussing the

adequacy of using qualitative analysis and continue describing the methodology used to test and validate the models.

2.3.3.1 Qualitative Analysis

Qualitative analysis (Miles 1994) '*is a powerful tool for assessing causality and is able to identify mechanisms, going beyond sheer association. It is local, and deals well with the complex network of events and process in a situation. It can sort out the temporal dimension, showing clearly what precedes what, either through direct observation or retrospection and show the underlying variables, and that these variables might have connections over time*'. Or in the words of Croswell (1998) *'Qualitative research is an inquiry process of understanding ... The researcher builds a complex, holistic picture, analyses words, reports detailed views of informants, and conducts the study in a natural setting'*.

A qualitative inquiry strategy (Patton 1990) '*emphasises and builds on several interconnected themes*'. The most important are:

- *Relevance of qualitative data* – The analyses focus on naturally occurring ordinary events in natural settings, so that it is possible to have a strong handle of what "real life" is like. Another feature of qualitative data is their richness and holism, with strong potential for revealing complexity;
- *Naturalistic inquiry* - Studying real-world situations as they unfold naturally; non-manipulative; unobtrusive, and non-controlling; openness to whatever emerges – lack of predetermined constraints on outcomes;
- *Inductive analysis* – Immersion in the details and specifics of the data to discover important categories, dimensions and interrelationships; begin by exploring genuinely open questions rather than testing theoretically derived (deductive) hypotheses;
- *Holistic* – The whole phenomenon under study is understood as a complex system that is more than the sum of its parts; focus on complex interdependencies not meaningfully educed to a few discrete variables and linear, cause-effect

relationships. The researcher's role is to gain a "holistic" (systemic, encompassing, integrated) overview of the context under study: its logic, its arrangements, and its explicit and implicit rules.

The validity, meaningfulness (Patton 1990) and insights generated from qualitative inquiry have more to do with the information richness of the cases selected and the observational/analytical capabilities of the researcher than with the sample size. For example, Piaget contributed a major breakthrough to our understanding of how children think by observing his own two children at length and in great depth. Freud established psychoanalysis based on fewer than ten clients.

A qualitative method permits the study of selected issues in depth and detail. Approaching fieldwork without being constrained by predetermined categories of analysis contributes to the depth, openness and detail of qualitative inquiry.

Quantitative measures (Patton 1990) are *'succinct, parsimonious, and easily aggregated for analysis, quantitative data are 'systematic, standardised, and easily presented in a short space. By contrast, the qualitative findings are longer, more detailed, and variable in content; analysis is difficult because responses are neither systematic nor standardised'.*

Yet, the open-ended responses allow the understanding of the world as seen by the respondents. The purpose of gathering responses to open-ended questions is to enable the researcher to understand and capture the points of view. The advantage of the quantitative approach is that it is possible to measure the reactions of many subjects to a limited set of questions, thus facilitating comparison and statistical aggregation of the data. By contrast, qualitative methods typically produce a large quantity of detailed data about a much smaller number of people and cases.

2.3.3.2 Validity and Reliability of a Qualitative study

To be valid and reliable a qualitative study should address a number of questions. How credible are the findings and the rigor employed by the researcher? Although the exact

conditions of the study cannot be replicated would a similar investigation yield findings roughly congruent with the original study? How replicable are the study's interpretations given the same set of data? Can we be sure that the study's findings are valid representations and not simply a set of conclusions by a biased researcher?

The threats (Padgett 1998) to the credibility and trustworthiness to qualitative studies fall into three categories:

- **Reactivity** – It refers to the potentially altering effects of the researcher's presence in the field. How are we interfering with the setting affecting the behaviours, attitudes and feelings?
- **Researcher's bias** – It is the temptation to filter one's observations and interpretations through your own preconceptions and opinions. Researchers may deliberately choose informants that fit them, or may ask leading questions during interviews to get the answers they want, or may ignore data that do not support their conclusions.
- **Respondent's bias** - At one extreme it can be the withholding of information and even lies to protect respondent's privacy or to avoid revealing some unpleasant truths. At the other extreme, the respondents may try to be "helpful" and offer answers that they believe we want to hear.

There are two basic tactics for enhancing rigor and trustworthiness adapted to each threat (Table 2.1) Triangulation and Member checking.

Table 2.1. How to Overcome the Threats to the Trustworthiness of Qualitative Studies

	Reactivity	Researcher Bias	Respondent Bias
Triangulation	+	+	+
Member checking	+	+	+

Triangulation is the combination of methodologies in the study of the same phenomena (Patton 1990). This can mean using several kinds of methods or data, including both

qualitative and quantitative approaches. There are four basic types of triangulation (Denzin 1978 in Padgett 1998):

- **Data triangulation** – The use of a variety of data sources (interviews, archival materials, observational data, etc.);
- **Researcher triangulation** – the use of several different researchers to achieve agreement;
- **Theory triangulation** – the use of multiple theories perspectives to interpret a single set of data;
- **Methodological triangulation** – the use of multiple methods to study a single problem, for example, combining quantitative and qualitative methods in a single study;
- **Interdisciplinary triangulation** – the use of more than one discipline in a single study. A social work researcher, for example might collaborate with a psychologist, sociologist, anthropologist or historian.

According to Scandura & Williams (2000) that made an extensive assessment of the research methodologies in management '*triangulation can improve external*[5] *and internal validity*[6] *as the combination of separate research strategies in one study helps to counter the trade – offs inherent in others.*'

This research combined data triangulation (Qualitative data from the interviews is used to complement and supplement data from bibliographical and archival documentation), theory triangulation (the analysis of PFI used risk management and decision analysis) and finally methodological triangulation – qualitative data for the CSFs and Qualitative and Quantitative models for risk management.

[5] External validity concerns the generalisation to different samples, of previously established relationships.
[6] Internal validity concerns a cause-effect relationship. Typically laboratory experiments have high precision and control of variables.

2.3.4 Case Study Analysis

Case studies are '*studies of events within their real-life contexts*' (Miles & Huberman 1994) and become '*particularly useful where one can identify cases rich in information – rich in the sense that a great deal can be learned from a few examples of the phenomenon in question*' (Patton 1990). A case can be a person, an event, an organisation, a time period, a critical incident or a community. Regardless of the unit of analysis (the level at which information is required for decision making) a case study seeks to describe the unit in depth and detail, in context and holistically.

Qualitative fieldwork begins by gathering data and allowing patterns to emerge . Next, this exploratory process gives way to confirmatory fieldwork. This involves testing ideas, confirming the importance and meaning of possible patterns, and checking out the viability of the findings with new data and additional cases. This stage of fieldwork requires considerable rigor and integrity on the part of the researcher in looking for and analysing '*confirming and disconfirming*' cases. Confirmatory cases are additional examples that fit already emergent patterns; confirm and elaborate the findings, adding richness, depth and credibility. Disconfirming cases are no less important. These are the examples that don't fit. They are a source of other possible interpretations as well as questions raised about the findings. They may be "the exceptions that prove the rule" or exceptions that disconfirm and modify what appeared to be emergent patterns.

Case studies (Yin 1994) can be done as:

- *Single case study*, in the case of Critical, Extreme/Unique or Revelatory phenomena, that is the instance (Miles & Huberman 1994) "proves" or exemplifies the main findings. Searching deliberately for confirming and disconfirming cases, extreme or deviant cases, and typical cases serve to increase confidence in conclusions;
- *Multiple case studies*. The number of cases used depends (a) if one is trying to assess or predict similar results (a *literal replication*) or (b) produces different results but for predictable reasons (a *theoretical replication*).

To assess literal and theoretical replications usually three to four case studies are used in each case (Yin 1994). If the cases are somewhat contradictory, the initial proposition

must be revised and retested with another set of cases. The logic underlying the use of multiple-case studies is to consider them as one would consider multiple laboratory experiments. Both follow a "replication" logic, similar to the ability to conduct a limited number of experiments in related topics and deal with contradictory experimental findings.

Case study analysis and scientific experiments have analogies: both are used to validate (or not) the theoretical developments. Both are holistic – they describe the entire phenomena in the study and are done in relatively small numbers. In both, the analysis and validation of the findings can be very complex involving a multitude of triangulation techniques. In experimental science, for example chemistry and physics, similar to case studies the aim of the analysis is to provide supporting evidence for a proposed theoretical framework. The fundamental difference is that in a laboratory the experiments are in a closely controlled environment, while in case studies the environment has a multitude of variables open to multiple interactions that often are unknown or overlooked. Nevertheless case studies are much richer in information and as they are open can provide insight on unforeseen issues. Multiple case analysis is not analogous to the analysis of multiple respondents in a survey (or to the multiple subjects within an experiment), it doesn't follow a "sampling logic". It doesn't follow a statistical generalisation to a larger population. It is deterministic (Lee 1999) in that *'a theoretical proposition, concept, or ideas fits, partially fits, or does not fit with the facts of the case study under study'*.

Surveys look for prevalence (or incidence) of a phenomenon in a population. Whereas the main objective of case study analysis is the development of a theoretical framework. Case study analysis contrast with surveys where the analysis is *a priori* structured and easier to undertake. In a survey, the selection of a representative sample is one of the key issues, and depending upon the size of the whole population a very large sample (large number of units of analysis) can be required in order to have valid conclusions. In contrast, case study analysis usually involves a relatively small number of cases (unit of analysis) to achieve the required theoretical generalisations, relying on triangulation and member checking to validate its conclusions.

Case study research has also some limitations. Yin (1994) has identified three sources. First, is the potential lack of rigour, because the researcher is solely in control of the application of the research methods. Thus the research quality is dependent on the

quality of the researcher. Secondly, is their poor use of generalisation. Carroll and Johnson (1990) state that '*the primary goal is to understand the case itself; only later might there be efforts to generalise from the case to broader principles*'. This implies that the emphasis and strength of case study research is on understanding, not generalisation. Thirdly, case studies involve vast amounts of data that very often are difficult to organize and to understand its relevance.

Lee (1999) on his assessment of qualitative methods in organizational research, considers that Yin case study methodology offers meaningful reliability and validity (internal and external). The current research seeks to focus on the strengths of the case study research as it is used to increase the understanding of the underlying reasons for the answers to the proposed research aims. The other criticisms – lack of rigour and vast amount of data - are acknowledged and taken into account throughout the research development.

2.3.4.1 PFI Case Studies

A PFI project is an appropriate unit of analysis for the study of CSF and Risk Management Models. The main characteristics of case study analysis-making use of qualitative data are adequate to the objectives of the current study:

- Development of theoretical frameworks;
- Naturalistic inductive analysis;
- And holistic nature.

It's real life, there are issues that can only be understood from a holistic perspective, and the objective of the current research is the development of theoretical frameworks.

In PFI, the key decisions are always made at the top level, taking into account the project as a whole, consequently it makes sense to consider a PFI project as the appropriate unit for a case study. Case study analysis being holistic and integrative in nature is particularly adequate to the current research.

To validate the theoretical developments, i.e., to assess theoretical replication, which is different results but for predictable reasons it will be necessary to use a multiple case approach. Based on the exploratory research it is expected that the main factor that distinguishes PFI is the sector were the project is developed – Transports, Health, Accommodation, etc. - so case studies in different sectors were done to assess theoretical replication. To validate each case study a Data Triangulation approach is adopted using a variety of data sources: literature review, archival materials, interviews, etc.

The assessment of literal replication, or similar results expected, undertaking for example, three case studies on the same sectors, has not been done because it was outside the scope of the current research which was to test the applicability of the models to different sectors, but should be used in future research developments.

Both the CSF and Risk Management Models in PFI projects are expected to vary according to the sectors where they are implemented. Therefore, both literal and theoretical replication can be sought within a multiple-case design.

The amount of data that needs to be obtained for each case study is considerable. This places some constraints on the sample size. Taking into account the resources available and the need to increase the potential for generalisation it was decided to undertake four in depth case studies within different sectors both in the UK and Portugal, and to collect data from other PFI projects and experts on the PFI market also both in the UK and Portugal.

A limitation of the research is the reduced number of sectors covered by the case studies developed to test and validate the model. This is counter balanced by the several interviews with finance and project management people that had interacted with various sectors and provided the holistic perspective of PFI. Also the extensive literature review provided valuable insight to minimise this limitation

2.3.5 Empirical Data

Primary and secondary data was collected during the fieldwork at three levels:

1 – For the development of in-depth PFI case studies:

- *Lusoponte* (Transport) the PFI to build and operate two bridges in Lisbon, Portugal (Annex II). The Concession Agreement, awards the design, construction and financing of the Vasco da Gama Crossing, plus the operation and maintenance of both the new and the existing 25th April Crossings. To settle all pending disputes and claims a Global Settlement Agreement (GSA) was signed on the 3rd July 2000, that extends and establishes the concession expiry as 24th March 2030, irrespective of the number of crossings, and includes the additional obligation for Lusoponte to undertake pre-feasibility studies for a 3rd crossing over the Tagus;
- *The Victoria Dock Primary School* (Education) in Hull, UK a PFI to build and operate a primary school (Annex III). It was the first school in the UK to be built under a PFI scheme. It was such a successful project that an extension of facilities soon had to be contemplated. The new building was completed in January 2001, and opened by Lord Puttnam in September 2001. The land where the school was built has been leased to the Sewell group for 40 years, although the PFI contract is for only 25 years. After this period and for 15 years the buildings and land can have alternative usages such as: continue as a school, disco, nursery, homecare, according to the local residents' needs in 25 years.
- *The Joint Services Command Staff College* – JSCSC (Education, but focused in the construction stage) in Watchfield, UK (Annex IV). The PFI Contract awards to Defence Management the design, construction, financing and the operation and maintenance of the JSCSC for 30 years. This College merges the educational activities of three services: Army, Navy and Royal Air Force. The construction of the building was done on time, but the costs escalated from £88 million to £120 million at the expenses of the construction sub-contractor;
- *Indáqua Feira* (Water and Wastewater Systems Construction and Operation) in Santa Maria da Feira, Portugal (Annex V). Indáqua Feira was awarded the

concession for water distribution and wastewater in Stª Maria da Feira. The Municipality committed itself to build part of the necessary infrastructure, for which it needed the contribution of the Cohesion Funds. However, in the meantime the political guidelines changed and the Municipalities were not allowed direct access to the funds. This has left the Stª Maria da Feira unable to fulfil its contractual obligations, and has led to a standstill in the construction of the sewerage networks.

2 - Information drawn from PFI projects: the *Manchester Fire Station* in the UK *Hospitals and Prisons* in the UK, and the *SCUTs* (shadow toll roads) in Portugal.

3 - Generic information on PFI was also obtained from interviews (other than those done for the PFI Case studies) with experts in PFI:

- E.C. Harris Capital Project and Facilities Consultant – David Wood, Leslie Gerelli, Thimothy Neal, Geoffrey Hawkings and Weng Lee;
- Povall Flood & Wilson – Brian Grew;
- Kvaerner Construction – Paul Gandy;
- McBains & Cooper – Construction and Property – James Baines and Andrew Rogerson;
- Price WaterhouseCoopers – Jackie dos Santos;
- KPMG – Melanie Speller and Catherine Broadbent;
- AON Risk Services – Mike Durejko, Johann Meeke, Peter Adlington and Gary Winson;
- Finpro - Dr. António Paula Santos;
- Banco Espírito Santo Investimento - Dr. Rui Baptista;
- Banco Efisa - Dr.Nuno Cardoso;
- ABN Amro - Drª Mariana Abrantes de Sousa;
- Banco Português de Investimento - Dr.Tiago Simões de Almeida;
- Instituto de Estradas de Portugal – Dr. Rui Soares;

- 4Ps – Public Partnership Programme – Martin Lipson;
- Universidade Nova de Lisboa – Department of Environmental Studies – Prof. Gomes Ferreira.

For the case studies a Case Study Protocol and an Interview Guide were developed (see Annex I).

2.4 Conclusions - How derived

All the conclusions drawn in the research were based upon the data collected and upon consideration of all the constraints reservations and limitations. It combined all the findings and the models were conceptualised, tested and validated according the developed research methodology.

This chapter presented the research methodology. Chapter 3 explains how an adequate socio political and economic framework is needed for the development of PFI.

CHAPTER 3

The PFI' Political Social and Economic Environment

3.1 Introduction

This chapter describes the international historical context that led to the development of PFI. Although a national policy (Kerr 1998), the underlying rationale of PFI must be analysed and integrated as each state is a participant in the global economy. Since the mid 20th century in the USA and, more recently, since the 1970s in Europe, Asia and other Developing Countries, national governments have increasingly used private capital to implement infrastructure projects and to provide services previously in the scope of the public sector. They do it using several types of concessions. Following this trend, in 1992, the UK Government announced the PFI, a guidance and a legal framework for concessions in the UK This chapter concludes presenting the main political socio and economical issues that affect the development of PFI.

3.2 Concessions: Early Years – 17th to 19th centuries

Concessions use private capital in projects that are of the initiative of a government, but they are a different mechanism from the privatisations and contracting-out, as it was discussed in Chapter 1 when PFI (a special form of concession) was introduced. In privatisations, the ownership of the assets changes and the responsibility for provision of services lies with the private sector. The public sector might retain a regulatory role in some sectors. In concessions, unlike privatisations the ultimate responsibility of service provision lies with the public sector. In contracting-out, the private sector only provides services, not capital assets, unlike concessions, where capital assets might be provided by the private sector. The differences can be summarized as presented in Table 1.1.

The International Finance Corporation (IFC), an affiliate of the World Bank defines concessions as '*An agreement usually with a government authority, to operate one project or provide the specified services for a certain period*' (IFC 1999).

The theme that this chapter will try to develop is therefore: *What are the Political and Macro-Economic factors that have influenced the development of concessions?* Government policies are dictated not only by domestic conditions but also by the developments in the political ideologies, international economic conditions, and financial markets. This is especially relevant in the case of open economies, such as the UK and Portugal (the two countries where the fieldwork for the research was undertaken). Concessions are always from the initiative of national governments, so to understand their development, they must be integrated in the rationale of policies that reflect the ideological, political and economic conditions in each country.

The history of concessions goes back a long way, as they are (Hollihan 1994) not a new mechanism for infrastructure development. Concessions were an often-used mechanism from the 17th to the middle of the 19th century in the form of BOT (Build-Operate-Transfer) or BOO (Build-Own-Transfer) concessions. With a BOT, the private sector is required to finance, design, build, operate/manage the facility, and transfer the asset free of charge to the host government, after a pre-specified concession period. BOO is similar except that the asset is not transferred back.

Examples of early concessions are (Urbanik 1999) the private toll roads in the 17th century, in England. The English Parliament began granting franchises to private companies for the maintenance of public roads, allowing the companies to charge tolls for the use of roads. These toll roads were called "turnpikes", named for the turning of a pole, or pike, to permit entry of a vehicle after the driver paid the toll. Over 1,000 turnpike companies maintained 32,000 km of roads in England in the 1830s. After this period, increased competition from railways began to hamper the profitability of the turnpike systems.

In the United States of America (USA), turnpikes were introduced in the late 1700s as profit-making ventures. Routes among towns in the Northeast became mud roads during spring and winter. Inter-town commerce was virtually impossible when it rained because

of difficulties passing over the mud roads, so private concessionaires paved the roads with wooden logs (later with flat wooden planks) across the mud on the road and had concessions through which they could charge a toll. Early United States (US) turnpikes were local government projects, but later turnpikes were privately operated. However many turnpikes failed to make a profit, and most returned to county control by 1850.

Another example is (Huang 1995) the 99 years water concession Lyonnaise des Eaux (France) signed in 1853. By 1900, privately owned concessionaires provided a majority of public services in France.

Table 3.1 summarises the main macro-economic, political and ideological developments that took place in the 19th century and that influenced the development of concessions. A summary of the most relevant privately financed projects is also included.

Table 3.1. Context of Privately Financed Projects in the 1800s

Macro-Economic Environment	Milestones	Privately Financed Projects
1800s		
Industrial Revolution fuelled by the ideas of both the 17thcentury French Physiocrats in France advocating *'laissez-faire'*, i.e., non-intervention by the government in individual or monetary affairs, and, Adam Smith with *An inquiry into the Nature and of the Wealth of Nations* (1776). Both contributed to the belief that the basic production facilities - land and capital- should be privately owned, and that distribution of wealth is most efficiently accomplished through free trade without government interference. The application of mechanical power to production brought with it an increase in efficiency, which made goods abundant and cheap. Consequently, the real standard of living rose throughout much of the world during the 19th century. However, it had serious human costs. Abusive child labour, long working hours and dangerous and unhealthy workplaces were common. In the USA, the modern corporation begins to emerge, with an immense financial power, and forms monopolies that could control an entire industry.	Karl Marx helped by Friedrich Engels writes *Das Kapital* (1867-1895) where states his moral condemnation of the capitalist system's class structure and advocates Communism. The major resource and means of production are owned by the community rather than by the individuals, and the responsibility for meeting public needs rests with the government. **1890:** The US Congress passes the Sherman Antitrust Act, banning business from joining together to control markets.	**1825:** in the UK the first public railway between Stockton and Darlington is inaugurated. **1830:** US Railways. First section of the Baltimore & Ohio opened to traffic. **1853:** Lyonnaise des Eaux was awarded a water concession. **1859:** Suez Canal construction starts. **1863:** London Underground starts. The Metropolitan Railway opened the first underground line between Paddington and Farrington St. with steam-hauled trains. **1882:** Panama Canal construction starts.

Source: IFC, 1999; Peterson, 1999; Meyer, 1999; Weisser, 1999, Encarta, 1999.

The macroeconomic environment favoured the development of major infrastructure projects financed by private capital through concessions in several areas such as railways, tramways, highways, and canals, in the USA, Europe and Africa. The Victorian Railways and the London Underground (Grubb 1998) were built primarily with private money, designed by private engineers, and licensed by the public sector. The world's first public railway was the Stockton and Darlington, which opened in 1825. The Metropolitan Railway opened the world's first underground in 1863. The railways remained in private hands until 1948 when the UK government completed the nationalisation of the railways, docks, canals, airlines and road freight.

An example of private funding in infrastructure development involved US western rail (Overton 1999). The need for transcontinental lines was felt so urgently that construction of the Union Pacific Railroad began during the American Civil War (1861-1865). The US Federal Government offered concessions to private sector companies to build the rail track out to the West Coast. To give incentive to the private sector companies to build that railroad, each company was granted one-half mile of public land bordering the railway in each direction. The companies then had the right to develop these lands, whose value was increased by construction of the railway giving the private sector an opportunity to further increase their income. In return, the railways gave the government a substantial reduction in rates for the usage of their services.

Another well-known example of private funding is the *Suez Canal Concession* (The Napoleon Foundation 1998). Ferdinand de Lesseps, a French engineer and diplomat in Egypt got the exclusive rights to set up the Universal Company of the Suez Maritime Canal, to use the canal and to construct a port at each end. The concession was for 99 years, beginning the day the work started. At the end of this period, the canal would become the property of the Egyptian government. The company capital was set at 200 million gold francs divided into 400,000 shares at 500 francs per share. The share subscription was an unprecedented success throughout Europe and the Ottoman Empire. On April 25, 1859, construction began, and the French Empress Eugenie inaugurated the canal on 17 November, 1869. On July 26, 1956, Egypt nationalised the Canal and in 1962, all original shareholders were paid off.

Concessions substantially fell out of favour during the late 19th and early 20th centuries. The main reasons were:

- *Private sector abuses of monopoly pricing power*: By the 1870s, US railways were under public pressure. They were accused of anti-competitive collaboration with some petroleum-refining companies such as The Standard Oil Company, a corporate monopoly, or trust, run by the industrialist John D. Rockfeller. In 1911, the US Supreme Court ruled the first big anti-trust case, stating that the company was an unlawful monopoly that hindered free competition. The railways also came under attack by the *"Granger Movement"*, the powerful fraternal agrarian association that grew out of a number of grievances that farmers had against the railways, mainly concerning overpricing of freight charges on agricultural commodities;
- *Financial failures:* Over time, many of these projects foundered and financiers lost significant amounts of money. An example was the Panama Canal. In the late 1870s a private French company directed by Ferdinand de Lesseps, which had already overseen the construction of the Suez Canal, won a concession from Colombia (Panama was then a province of Colombia) to build a sea-level canal to link the Pacific and Atlantic Oceans. Financing was raised and construction began in 1882. The company quickly ran into problems caused by the difficult terrain, climate, tropical diseases, labour shortages, and a flawed design. In 1888, it ceased work and went into bankruptcy;
- *Increased government role:* General trends at this time included growth of the government sector and popular belief that the Government would not abuse its own monopoly power. Many thought that the government could engage in more integrated planning than the private sector because it controlled the development of urban plans, and consequently infrastructure projects like roads, bridges, hospitals and schools. This shift in public attitude toward the government policies was caused mainly by changes in the ideological, intellectual and social environment. At the turn of the century, capitalism was the dominant economic and social system; nevertheless, industrial capitalism that had led to the Industrial Revolution had also resulted in serious human costs with appalling conditions for a large number of workers. This led to the emergence of socialist and communist policies initiated with the work of Karl Marx and Friederich Engels that favoured state intervention with land and capital owned collectively, that is, by the society.

3.3 Re-birth of Concessions: First-half 20th Century

The first half of the 20th century saw several cycles in the macro-economic environment, as summarised in Table 3.2. Before World War I, it was the end of the Industrial Revolution and the emergence of socialist theories that advocated state control of the economy. As such, in the early 20thcentury (Plessa 1998) most infrastructure projects were Government financed. Between the Great Wars in 1936, John Maynard Keynes published *The General Theory of Employment, Interest and Money,* which laid the basis for modern capitalism that would be applied in the Western World after World War II. For 25 years (Kerr 1998) after the war, the mixture of Keynesian theories and traditional forms of capitalism were very successful. Western capitalist states enjoyed nearly uninterrupted growth, low rates of inflation, and rising living standards. It was then, by the mid 20th century, that concessions started to re-emerge in the USA to fund infrastructure development. The improvements in the socio-economic context and the development of US financial markets contributed to this. Financing of roads in USA had switched from private ventures to state control. By the end of World War II (1939-1945) many roads were congested and deteriorating. The rapid increase in the number of cars and the subsequent demand for adequate highways led local governments with limited financial resources to award concessions to the private sector for bridges, tunnels and highways. Modern highway construction resumed nation-wide, and many of these roadways were built as toll roads.

Table 3.2. Context of Privately Financed Projects in the First-Half of the 20th Century

Macro-Economic Environment	Milestones	Privately Financed Projects
1900-1945s		
Russian Revolution in 1917 leads to the first communist state. World War I (1914-1919). US Wall Street collapses in 1929, and begins the Great Depression. Roosevelt launches the New Deal (1933-1938) to counteract its effects. A major restructuring of the financial system is undertaken. World War II (1939-1945).	John Maynard Keynes publishes the *General Theory of Employment, Interest and Money* (1936) and lays the basis of modern capitalism. Governments use their powers to spend money, vary taxes and control the money supply in order to control or eliminate the curse of capitalism -the cycles of 'boom and bust'. In a depression, government should increase its spending, even at the cost of unbalanced budgets, to offset the decline in private spending. The process should be reversed if a boom threatens to get out of hand, leading to excessive speculation and inflation.	
1945-1960s		
The two opposing ideologies, communism and capitalism, co-existed for 25 years. Between 1945 and 1975 the number of Communist countries greatly increased, partly because the division of the world after World War II, and because communist movements gained strength in various parts of the Third World, China and Eastern Europe.	The Keynesian theories are incorporated into US law when Congress passed the Employment Act in 1946, representing the formal abandonment of *laissez-faire* as national policy. **1948:** The UK government finalises the nationalisation of rail companies. Milton Friedman publishes *Studies in the Quantity Theory of Money* (1956), laying the basis of Monetarism. Their main concern is money and its effects. To reduce inflation, the growth in money supply needs to be controlled.	**1950s:** In the USA, modern highway construction resumes nationwide.

Source: IFC, 1999; Peterson, 1999; Meyer, 1999; Weisser, 1999; Encarta, 1999.

In addition, in the USA, the domestic financial markets were by then developing a sophistication and volume that enabled such projects to be funded as concessions. Effective financial regulation and tax incentives generated a large pool of insurance and pension fund resources with very few investment restrictions. In Europe, lenders and investors didn't have such incentives. Support for infrastructure projects was provided against government guarantees. The US finance industry (Drucker 1999) was until the 1970s much more entrepreneurial in style than its European counterparts. It was only after the 1962 Cuban Missile Crisis that the Russian State Bank, afraid of having its American assets frozen, shifted its foreign reserves to London. However, the Russians wanted their money in dollars. This, along with the negative balance of payments in the

USA led to the creation of the Eurodollar. This financial innovation signalled the start of the rebirth of the City of London. More innovative financial tools were created from then on.

Beginning in the late 1960s, however, inflation erupted nearly everywhere, and unemployment rose. At the same time social-welfare spending by governments continued to grow, posing serious budgetary constraints to governments.

3.4 New Developments in the 1970s and 1980s

During the 1970s, important changes in the political environment were taking place, as summarized in Table 3.3. Keynesian policies were in crisis, being replaced by Monetarism with strict control of the money supply to control inflation and low taxes to encourage investment and minimal government intervention. Privatisation started, regulations were changed, and state subsidies removed. In the Western world, Monetarist policies became increasingly common. Governments had inherited large state monopolies and sectors such as energy and telecommunications, which were heavily regulated. Greater focus on the private sector necessitated major regulatory reforms such as large-scale privatisation's that, in turn, have created new markets in areas previously operated only by the government. For example, in 1978, the US government passed the Public Utility Regulatory Policy Act (PURPA) and established a new private market for electric power.

Table 3.3. Context of Privately Financed Projects during the 1970s and 1980s

Macro-Economic Environment	Milestones	Privately Financed Projects
1970s		
1973: Bretton Woods system of fixed currencies collapses. Floating exchange rates are introduced. The stability of global finance is no longer based in the convertibility of world money (dollar) into gold. States and Central Banks took over the function of gold acting as guarantors of the credit system. The States necessitated adjusting the ratio of debt to GDP. This entails a policy of tight money and sound finance and thus the replacement of an expansionary policy by a policy of state austerity and the containment of inflation by closing the gap between the expansion of the money supply and productive activity. Creation of the European Monetary System (EMS) in 1979. The primary purposes of the EMS were to stabilise exchange rates in the EU, and to aid the long-term process of European monetary integration. The central component of the EMS was the ERM, a voluntary system of fixed exchange rates. This system was based on the European Currency Unit - ECU (which later became the Euro in 1999). Under the ERM, the currencies of participating countries were allowed to fluctuate in relation to each other and to the ECU, but only to small amounts. **1979:** Conservative government of Margaret Tatcher was elected. Its policy was based on the monetarism economic theories.	Foundations for project financing in the power sector. Previously confined to the mineral resources sector. In the late 1970s deregulation starts in the Western World. **USA:** PURPA is passed and establishes a private market for electric power (1978). It provides the foundation on which non-recourse lending could take place in the power industry.	**UK:** British Petroleum (BP) raises finance to develop its Forties oil field in the North Sea (1972).
1980s		
Monetarist orthodoxy was abandoned as a consequence of the debt crisis in 1982 The state policy is one of a monetary framework of tight money and state austerity, and the encouragement of credit based private consumption. The outcome is that money (credit) replaces the state as the agent of restructuring, while the money form is imposed in the state (value for money audits) and large-scale privatisation's take place. Despite the attempts to restructure the state, many national states were still confronting a crisis of over-accumulation. The underlying weakness of the 'real' economy indicated that the expansionary policy of easy credit in the 1980s was not sustained by capital growth but rather by an inflationary growth in the money supply. Financial crash in 1987. Company liquidations increased, unemployment soared and private debtors were faced with consumer default.	Macroeconomic policy changes - national states are forced to introduce policies to improve their position in the global price hierarchy, to depoliticise their domestic policy and reduce further state expenditure. Regulatory reform continues. **UK:** the Ryrie Rules are published in 1981 setting the principles for private funding of public projects.	**USA:** AT&T lost the monopoly in the telecommunications services (1984). **Turkey:** The PFI underlying concept (Tiong 1992), the BOT first appeared in recent times through Turgut Ozal in 1984, then the Prime Minister of Turkey within the framework of privatising Turkey's public projects. The first BOT project for infrastructure is developed in 1987.

Source: IFC, 1999; Peterson, 1999; Meyer, 1999; Weisser, 1999; Encarta, 1999.

In Latin America and other Developing regions, authoritarian governments were being replaced by democracies. Their economies also had been heavily regulated and had huge state monopolies. So, gradually, new regions joined the trend for privatisation and encouraged private capital for the funding of government projects.

The breakthrough for concessions financing arose through the development of British Petroleum (BP)'s North Sea Forties oil field in 1972 (BPAmoco 1999). Due to the large volume of investments needed, traditional corporate finance was not possible, because the primary source of repayment of debt for investors was the sponsoring companies, backed by their balance sheets. The company just didn't have enough assets to be used as collateral for the loan. The oil field development was made possible by an innovative financial arrangement. BP raised £370 million from a syndicate of 66 banks, then the largest wholly private bank advance ever arranged. Lenders could not rely on the limited balance-sheet strength as security for their loans, and had to evaluate the present value of future cash flows generated by the project and use this as a security for their loans. Additional security was provided by the asset value of the oil and gas reserves in the event the project failed to be implemented or under-performed. The result was that the potential for Project Finance was realised. Subsequently, similar financial structures were applied to other sectors where the security available for lenders had certain similarities to oil and gas.

Project Finance is therefore (IFC 1999) a form of financing in which lenders look solely or primarily to the cash flows of a project to repay debt service and to all of the underlying project assets (including all physical and contractual assets) as collateral for the loan. There are two basic types: *Limited* and *Nonrecourse* financing. *Limited-recourse* project finance: Lenders look mainly at the cash-flows of a project to repay debt service, but permit creditors and investors some recourse to the sponsors for repayment. *Nonrecourse* project finance: Lenders look solely to the cash flows of the project to repay debt service and the assets of the property for security.

In traditional finance, the primary source (IFC 1999) of repayment for investors and creditors is the sponsoring company, backed by its entire balance sheet, not the project alone. Although lenders still seek usually to assure themselves of the economic viability of the project being financed, they still retain a significant level of comfort that they will be repaid even if the individual project fails. The lenders do not necessarily suffer as long

the company owning the project remains financially viable. In project finance, if the project fails, sponsors, investors, and lenders can expect significant losses.

Another important aspect in project finance is that the risks are borne not only by the sponsor but also by different types of investors such as equity holders, debt providers, and quasi-equity investors. Therefore, because the risks are shared, one criterion of a project's suitability for financing is whether it is able to stand alone as a distinct legal and economic entity. Project assets, project-related contracts, and project cash flows need to be separate from those of the sponsor.

3.5 Recent Developments: The 1990s

As summarized in Table 3.4, the main political events in the 1990s that influenced the development of concessions were the signing of the Maastricht Treaty of 1992, and the opening of the former communist economies. The Maastricht Treaty formalised the beginning of the monetary and economic integration of the EU, and set the Convergence Criteria (CC). The CC were the five conditions that countries had to meet if they wanted to take part in full economic and monetary union. They forced governments into disciplines and budgetary constraints that were dictated by more than just their own internal economic conditions. They were:

- *Inflation* - no more than 1.5% above the average inflation rate of the lowest three inflation countries in the EU;
- *Interest rates* - the long-term rate should be no more than 2% above the average of the three countries with the lowest inflation rates;
- *Budget deficit* - no more than 3% of GDP;
- *National debt* - no more than 60% of GDP;
- *Exchange rates* - currency within the normal bands of the ERM with no re-alignments for at least two years.

Table 3.4. Context of Privately Financed Projects since 1990

Macro-Economic Environment	Milestones	Privately Financed Projects
1990 - 1992		
In 1989, Poland holds the first free election, in the communist eastern block, starting the democratic process that led to the opening of the markets. By the end of 1991, the Soviet Communist Regime collapses, which starts the dissolution of the Union of the Socialist Soviet Republic (USSR). These developments signal the opening of the Eastern Bloc to modern capitalism. **1992:** Maastricht Treaty signed in February between the then 12 members of the EU. The treaty moves significantly towards economic, political and social union and set out the detailed timetable for EMU. It also sets out the Convergence Criteria for economies that wanted to join in EMU. **UK:** The Conservative government of John Major was elected in May 1992. The UK has joined the ERM in 1990, but the weakness of the pound forces Britain out of the ERM in 1992.	Expansion of sector coverage. Access to capital markets and securitisation. In the 1990s, most Latin American countries undertook two major policy reforms: private participation in pension fund management and infrastructure investment. **1993:** In the UK with the publication of the Railway Act begins the privatisation of the railways.	**UK:** PFI launch of a program of public partnership with private industry, to bring private investors into financing a wide range of traditionally government activities (1992). **USA:** COSO Geothermal project, $560 million. First project financing arranged in the quasi-public Rule 144A securities market. First project-related financing to achieve investment-grade status.
1993 - 1995		
More former communist countries continued to open their economies, embracing market driven policies. Globalisation accelerated with the economies of the former Eastern Bloc and Western bloc ongoing integration. This process is favoured by the technological developments in information technology.	Expansion of regional coverage. Securitisation of project equity.	**USA:** Indiatown Cogeneration Project, $505 million; publicly registered capital markets project financing. First to receive investment-grade rating during construction period. Several projects commenced in Japan, Philippines, Colombia, Mexico, Ivory Coast, Poland and Oman.
1996 - 1997		
1997: UK Labour Government of Tony Blair is elected and continues the on-going policies regarding PFI. **Mid 1997:** Asian financial crisis starts in Thailand and starts spreading to other countries such as Indonesia, Malaysia and South Korea. Japan's trade and investment is severely hit by the economic downturn in Southeast Asia.	Larger exposures, longer tenures, less government Multilateral Development Banks and Export Credit Agency involvement. Greater market access. Continued growth in regional coverage, and improved financing terms through mid 1997. Foreign currency crisis overtakes many projects.	**UK:** AES Barry, UK first merchant power plant financing to close; 230 MW gas-fired power plant. **UK:** Sutton Bridge. Gas-fired power plant project market a key development as the first Eurobond with a Rule 144A placement, which was London-listed and on which investors bear construction risk. First, investment-grade rating for a plant with some merchant power risk. China Tangshan Sithe Coal Fired Plant, $128 million. First limited-recourse project in China. Several projects commenced in Morocco, Saudi Arabia, Chile, Panama and Venezuela

(cont.)

Table 3.4. Context of Privately Financed Projects since 1990 (contd.)

Macro-Economic Environment	Milestones	Privately Financed Projects
1998		
August: the Russian government announces that it will devalue the currency and default on part of its foreign debt. The Dow Jones Index of the New York Stock Exchange plunged 1,800 points. The events were followed by a currency crisis in Brazil.	Continued innovation in selected financial areas, but slowdown in financial flows. Fewer new projects, many cancellations and debt restructuring.	Several projects commenced in China, Ivory Coast, India, Brazil and Mexico.
1999		
Financial systems in several emerging markets start to stabilise.	**September:** In Japan the Osaka Stock Exchange established the first PFI market.	

Source: IFC, 1999; Peterson, 1999; Meyer, 1999; Weisser, 1999; Encarta, 1999.

Project Finance had been a financial tool in use for hundreds of years in the mineral-resources sector, but its widespread use that started in the 1970's with BP and accelerated in the 1990's because of governments budget constraints and the consequent need to use private funds for infrastructure development. Simultaneously, the governments undertook the necessary regulatory framework for the application of the projects. These regulatory reforms created new markets for the private sector in areas where, previously, only the public sector operated. Simultaneously, partly at the government's initiative, but also because of advances in computer and communications technology, liberalisation, and globalisation of the financial markets took place. Very important was the development of information technology tools that enabled the appearance of a new set of financial debt, equity, and derivative products and a wider range of risk management techniques. Securitisation in the form of project bond offerings, starting in the early 1990's, and credit ratings for those bonds by major rating agencies, starting in the mid 1990s, were milestones that greatly influenced the development of project finance.

Since 1990, the flow of foreign investment to the Developing Countries has greatly increased. It has taken place chiefly through concessions and the associated project finance tools that increasingly use private capital to finance infrastructure projects. According to the World Bank, between 1990 and 1997, long-term flows to private sector borrowers in developing countries rose from about $44 billion to $322 billion. As shown in Table 3.5, project finance flows accounted for an estimated $123 million in

1997 before the financial crisis in 1997. Asia received the majority of project finance funds - $58 million in 1997. During the period from 1984 to 1995, 28% of the total projects for private infrastructure worldwide were in Asia.

Table 3.5. Project Finance Transaction by Region, 1997-98

Region	Number of Projects		Amount (millions US$)	
	1997	1998	1997	1998
Europe	207	104	81,703	26,173
Asia	191	63	58,405	27,477
Latin America	105	49	41,610	33,554
North America	75	33	28,400	15,033
Middle East & North	35	14	22,876	7,169
Sub-Saharan Africa	11	8	3,429	2,114
Total	624	271	236,423	115,520
Share of Developing Countries	380	140	123,169	60,069

Source: International Finance Corporation, World Bank.

Also, as shown in Table 3.6, out of the ten largest private investment projects during the same period, seven were in Asia (Park 1998). China is no exception; since late 1996 concessions have been awarded (Wang 1999) for several BOT projects, mainly power plants, water plants and roads.

Table 3.6. Top Ten New Private Infrastructure Projects 1984-1995

Location	Project	Cost (millions US$)
France/UK	Channel Tunnel	19,000
Taiwan	Taipei mass rapid system	17,000
Japan	Kansai International Airport	15,000
Argentina	Buenos Aires Water and Sewer	4,000
Thailand	TelecomAsia communication	4,000
China	Daya Bay nuclear power plant,	3,700
Malaysia	North-South toll expressway	3,400
Mexico	Petacalco coal-fired power plant	3,000
Thailand	Bangkok elevated road and train	2,981

Source: World Bank Private Infrastructure Project DataBase.

Since the onset of 1997 and due to the major financial crisis in Asia, the flow of foreign capital for the Developing Countries has declined dramatically (IFC 1999). Projects had their debt re-structured, while others were cancelled or deferred. The recovery will inevitably depend on the willingness of domestic banks and international banks to resume lending and the performance of local financial markets to calm investors' and lenders' fears about foreign-currency and interest-rate risks. In other developed countries, the investments have continued at the same pace. Nevertheless the experience of the last years has pointed out that these projects are complex and their start-up is time consuming. While there have been some impressive successes, unfortunately many projects never got off the ground, others have taken more time to develop than planned, and some have run into financial difficulties after only a few years of commercial operations. According to the latest data (Financial Times 2002) the project finance market shrank in 2001, as the number of project finance deals fell to 303, worth $144.6 billions. However, as also stated, some bankers, while acknowledging that in some areas there has been a decline, said that the lower figures were also a reflection of tighter definitions regarding what qualifies as a project finance deal.

3.6 Conclusions

Concessions have developed as a response by the governments to changes (Haque 1996) in the ideological values from Keynesian economics that predominated in the post-war era, to Monetarism. With it, the promotion of freedom is a major value. This means that a free market is seen as a predominant mechanism through which services and goods must be distributed, price being the signalling mechanism. Keynesian economics is heavily interventionist whilst monetarists advocate a minimalist state. These ideological shifts in government policies were dictated by the failure of the Bretton Woods system and the Keynesian welfare state. Concessions were also favoured because of enabling developments in project finance techniques, financial markets, and information technologies.

Summarising the reasons for this worldwide trend in the usage of concessions (Hollihan 1994, IFC 1999) there is a mixture of ideological, political, economical and financial factors:

- Abandonment of Keynesian theories, and the emergence of the New Capitalism that favours the regulatory intervention of the state, and the usage of private capital to fund its policies;
- Governmental budgetary constraints - EU member countries are not supposed to have total debt more than 60 percent of GDP; and in the Developing Countries the governments don't have sufficient funds for the necessary investments in infrastructure;
- Infrastructure in the private sector taps new sources of capital:

    1. Strategic investors, for example, developers and owners of power plants in the USA and other developed countries. Their power programs are mature in their home countries, and yet they want stay in the power business, so they are reinvesting offshore and building power plants in developing countries;

    2. Private sector lenders, typically life insurance companies and pension funds, a significant part of whose portfolio is required to be in the private sector. The long-term investment profile of these funds fits the long-

term debt issues of concessions. Also, the EU is considering to set limit pension funds investments to high risk holdings , which favours the PFI bond issuance market (Financial Times 2002);

- Globalisation of financial markets has helped to create a broader spectrum of financial instruments and new classes of investors;
- The recourse to project finance has two important advantages:

    1. It reduces the overall risk for major project participants, by tapping various sources - equity investors, banks and capital markets. Each demands a different risk/return profile for its investment, so large projects can raise finance at relatively low cost;

    2. The risks of a new project remain separate from its existing business. If the project, large or small, were to fail, would not affect the financial integrity of the sponsor's core business;

- Private sector efficiency - this has been one of the main justifications given by governments to justify the partnerships with the private sector. In effect, empirical research points out (Wolf 1988) that the private sector, being more dynamically efficient, is a better allocator of resources and therefore increases the efficiency of the country over time. One of the reasons advanced is that the public sector lacks competitive pressure to increase efficiency.

Concessions, although offering a number of advantages both to the public and private sector, pose stringent requirements to all stakeholders involved. First, a very long-term (20-30 years) relationship has to be managed. This implies dealing with human, technical, financial, environmental, and economic issues that can present unforeseen aspects in later years. Second, from the point of view of the government, by putting the private sector in charge of the provision of a service, the government doesn't waive the responsibility for the public service (Vives 1997) it only changes the type of responsibility, which can even bring an increase in its technical and political complexity. Delegating the service to the private sector means that the government has to adopt legal and institutional mechanisms to ensure that the service is provided efficiently and the responsibilities assumed by the private sector are fulfilled. Last, Project Finance is a demanding tool. Since it relies on the cash flows of the project, it requires the exhaustive

identification, analysis, allocations and mitigation of all risks. This is a complex process, subject to a great deal of uncertainty and lengthy negotiations. In order (IFC 1999) to attract financing, a project needs to be carefully structured to ensure that all parties' obligations are negotiated and are contractually binding. Financial and legal consultants and other experts may have to spend considerable time and effort designing the structure and conducting a detailed appraisal of the project. These steps add to the bidding costs of the project, which can only be recovered if the consortium wins the tender

Concessions using project finance techniques are a most valuable way of capturing private capital for otherwise publicly financed projects. However, their success depends primarily on the existence of a supportive regulatory framework - rules, regulations and policies - and of a developed financial market. Working to its advantage is the increasing globalisation and sophistication of financial markets that have innovated and created a broader spectrum of financial instruments and new classes of investors.

As mentioned earlier, PFI is part of this world-wide trend in private funding for public projects, but it has specific and innovative characteristics. Concessions have been in use for a long time, and conceptually PFI is also a concession. The difference between PFI and concessions lies in one innovative aspect of PFI. It relates the revenues for the private partner solely to the provision of a service, which in turn is performance related. The innovative focus on service provision has opened to the private sector a variety of sectors that previously were outside of the scope of concessions such as schools, prisons, accommodation, hospitals, etc., providing managerial and custodial services. Traditionally concessions were used only for infrastructure projects, but now with PFI a whole new range of sectors is available for private funding and operation.

The following chapters are dedicated to describe the proposed framework for PFI sustainability and constitute the essence of the conceptual framework developed, i.e., the model for the Sustainable Competitive Advantage of PFI. Chapter 4 introduces the PFI as a procurement tool. Based on the research it describes its life cycle, value chain and the main reasons for variability among projects. Finally assesses the competitive advantage of PFI. Chapter 5 proposes the PFI Risk Uncertainty Management model and Chapter 6 the PFI Critical Success Factors model.

CHAPTER 4

The Nature of PFI

This chapter describes PFI according to the traditional management frameworks, like the value chain, life cycle, etc. PFI is as a novel way to do business, and requires the establishment of a long-term relationship. PFI is an innovative concession as it relates the revenues for the private partner solely to the provision of a service, which in turn is performance related. To assess PFI success or failure is still premature due to the long life cycle of PFI projects, 20-30 years, and most projects have not yet been in operation for 10 years. Nevertheless, based on the experience gained by all stakeholders in dealing with these projects it is possible to point out to the existence of several issues that have to be addressed.

4.1 The Integrative and Holistic Nature of PFI

The background and development of PFI was described Chapter 1. A proposed definition for PFI follows based on the UK's Government published regulations, the background of PFI and its implementation procedures. PFI has been minimalistically characterised as a government procurement tool. An integrative and holistic definition must include the *"why"* and *"how"* of PFI. As such, the PFI definition adopted in this research follows:

> **PFI is an integrative, holistic, social and economic developing policy of the UK Government. It integrates a hierarchy of four levels of concepts: Government Ideology, Principles, Practices and Tools. In its essence is the provision of a public service funded by private capital.**

A comprehensive definition must begin with the Governments' fundamental beliefs that form the basis for PFI's conceptual formulation. The beliefs are the underlying condition for the government' policies, which in turn are put in practice by a framework of regulations. To implement these regulations a set of tools - management, technical, financial, etc. - is used. Figure 4.1 illustrates the PFI holistic and integrative model that was adopted. At the first conceptual level is the monetarist political and economical ideology. Monetarist's principles and beliefs are at the second conceptual level. The ones relevant for PFI are: the establishment of a free competitive market, the control of public expenses, and that VFM must be obtained by gains in efficiency and effectiveness (fostering innovation) and transferring the risk to the party best able to manage them (be it the private or public sector). At the third level are the Practices to implement the PFI projects: Free-Standing Projects, Joint Ventures and DBFO. Finally, at the fourth and last level are the main tools used in PFI projects: VFM-performance Auditing, Public Sector Comparator (PSC) Benchmarking, Project Finance, Risk Management, Value Management and Total Quality Management (TQM).

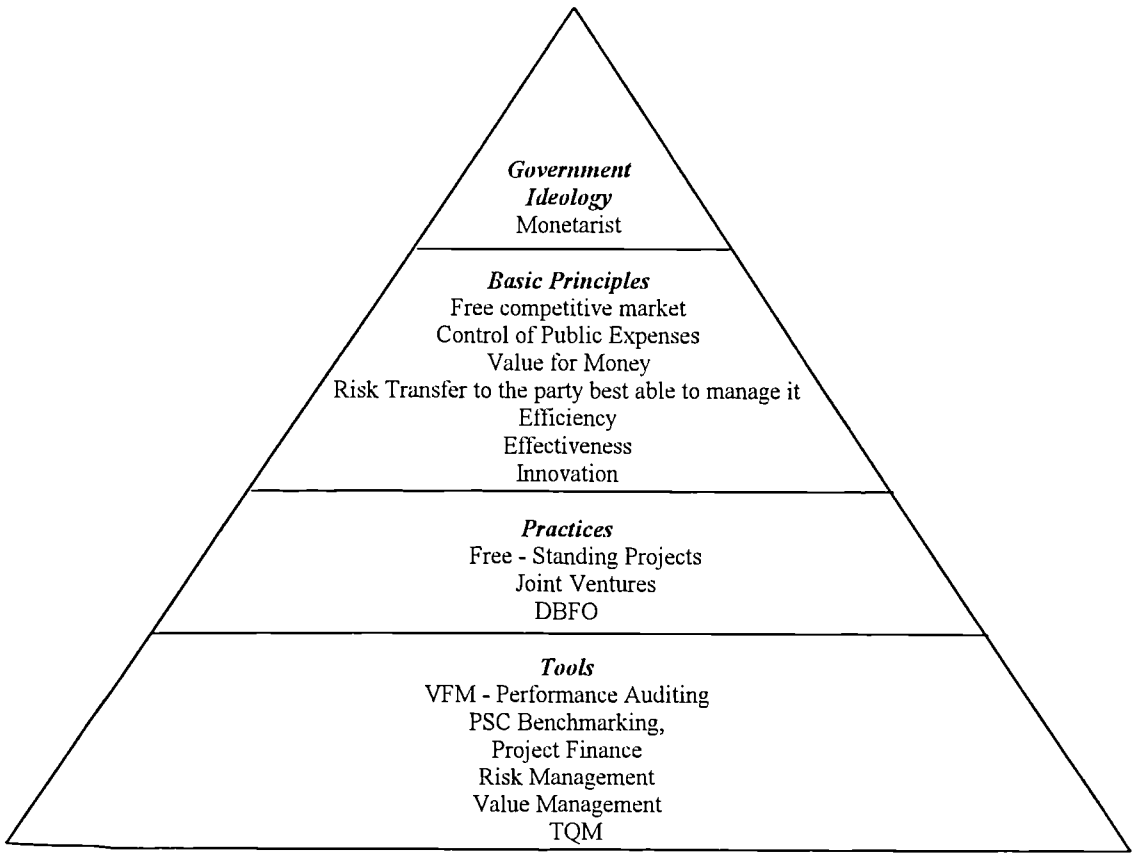


Figure 4.1. PFI Holistic and Integrative Conceptual Model

4.1.1 PFI Relation with Other UK Government Policies

The UK Government has launched in 1996 the PPP, and it is common to find reference to PPP/PFI. Then what distinguishes PPP from PFI?

PPP is one UK' Government policy to involve the private and public sector in Government initiatives in generic terms. Its purpose is to *"negotiate deals that are good for both sides"* (HM Treasury Taskforce 1997). PPP as in words of Tim Wilson, (1999) Head of Private Finance Policy Team is

> *'The PPP programme include: privatisation, improving regulation of utilities, wider market 'making state assets sweat', making Government commerce more businesslike (e.g. greater commercial freedom for the Post Office) and the Private Finance Initiative.....The PFI is a service funded in a variety of ways'.*

The fundamental difference between PPPs and PFI, being that PPP is a generic public private partnership, while PFI is a sub-sector of PPP, with the specific purpose to deliver a service of publicly managed assets using private capital.

4.1.2 PFI Relation with Other Forms of Concessions

Concession's fundamental principles are that the private sector is responsible for the finance, design, build, and operation of the service. The revenues of the project guarantee the financing. This basic scheme can present numerous alterations, depending upon the risk allocation between the private and public sector. The main categories of risks allocated are Finance (the public sector can subsidise projects that are not economically viable) Design, Build, Operate, Ownership and Transfer of Assets at the end of the concession period. The most common types of concessions are the BOT, BOOT-Build-Operate-Own-Transfer and DBFO.

The predominant model for a PFI is the DBFO, followed at distance by free-standing projects and joint ventures. In time, as each contract is unique, other forms of PFI will probably develop. Table 4.1 summarises how the three types of PFI projects compare

Table 4.1. Private Sector Involvement in Concessions

PFI

	Finance	Design	Build	Operate	Own	Transfer	Payment Mechanism	Characteristics
Free - Standing	Yes	Yes	Yes	Yes	Yes In Fixed term		Only Direct by Users, e.g. Toll	The private sector is required to recover all costs through charges on the final (usually) private users of the service. The public sector plays a facilitating role but no public money is involved.
Joint Venture	Partially	Yes	Yes	Yes		Yes	Users + Subsidies by Govt for social services, like urban regeneration schemes or congestion relief roads	The public sector contributes a subsidy to a project but the revenue comes principally from third parties. These projects have a positive cost benefit analysis, but would not be financially viable if funded by private finance alone.
DBFO Design Build Finance Operate	Yes	Yes	Yes	Yes	Yes In fixed term	Yes	Government pays only for services delivery	The private parties Designs, Builds Finances and Operates the facilities and the public partner purchases the services.
DCMF Design Const. Manag. Finance	Yes	Yes	Yes	Yes Manage	Yes In fixed term			Specific for custodial services. in the UK. the consortium provides prisoner places. Volume risk is taken by the public sector, that is also in charge of the policies relating to the individual prisoners.
BOT Build Operate Transfer	Yes	Yes	Yes	Yes		Yes		Concession life significantly shorter that the facility's economic life,. e.g., Coal – fired power plant typically 15-20 years for the concession vs. a plant life of 30-40 years.
BOOT Build Own Operate Transfer	Yes	Yes	Yes	Yes	Yes Fixed term	Yes		Synonymous of DBFO in the USA.
BOO Build Own Operate	Yes	Yes	Yes	Yes	Yes Fixed term			Consortium has a concession life as long as the expected economic life of the facility (30-50 years).

with other concessions. A YES indicates that private sector takes responsibility for that particular stage. In all forms of concessions, the private sector is required to Finance, Design, Build and Operate the facilities. The main difference lies with the Payment Mechanism, the Ownership and the Transfer Mechanism of the Assets at the end of the concession period. Regarding financing the exception are Joint Ventures where finance is provided both by the public and private sector, in all others it is the private sector sole responsibility.

4.2 Key Concepts related with PFI

In the bidding phase the participants have to deal with two of the most important criteria in a PFI project: VFM and PSC. A description of both concepts follows.

4.2.1 Value for Money

One of the main criteria for winning a PFI proposal is a clear demonstration of VFM. It is a financial test (Grout 1997) that compares the cost to the public sector of conducting the project with the cost of buying in the service from the private sector. When the public provision side is considered, the project is being valued from the cost side. That is the Treasury is calculating the present value of the cash flows of the cost of the project. When private provision is considered the project is calculated from the revenue side. That is the Treasury calculates the present value of the cash flows of the revenues of the project. Providing the correct price of risk is used for each calculation, then these two valuations are exactly the correct ones and the route with the lowest present value should be chosen.

Value for Money is often used by governments and public in current language but not always with the same meaning. VFM is a term used to describe two concepts:

- Public Accountability of Governments;
- An Accounting Method used in Performance Auditing.

Clearly both concepts are closely inter-related (Jacobs 1998) since there is a growing emphasis upon accounting and management of the public sector, and a link between accounting and public policy. One way that this emphasis has been expressed is in the practice of VFM auditing. VFM can be defined as *"an examination designed to determine whether the organisation in question is performing economically, efficiently and effectively in its use of resources, operations, procedures and pursuit of objectives"* (Jacobs 1998). Although different terms are used to describe the process (VFM, operational, performance and management auditing, economy and efficiency reviews) they describe the same thing. However, and very important to understanding this concept, the exact nature of VFM is dependent upon the legal mandate and practices in a particular context.

VFM was first used as a management tool. The case of New Zealand is particularly enlightening and it will be described it in some detail to better understand the evolution of VFM concept. In the 1970s, there was an economic slowdown, and the National Government went into power with a desire to cut costs within the public sector. There were also public demands for accountability sparked by a series of ministerial scandals and well publicised cases of departmental incompetence. Some new Government Ministers were committed to developing a business-like approach within their departments. There were also underway a number of financial and administrative reforms. In addition, during the 1970s many countries expanded the compliance and probity roles of the legislative auditor to include matters such as efficiency, effectiveness and performance of government units. In 1977, New Zealand Government publishes the Public Finance Act 1977 Section 25(3) that provided a legal mandate for the Audit Office to conduct performance or VFM auditing. While the Auditor - General did not have the power to question the merits of executive policy, he could inquire whether resources were applied effectively and efficiently in a manner consistent within a given policy.

The concept of VFM as a solution to the need to cut costs and to ensure that there was *'value for money'* from public spending was further developed under Tyler as New Zealand's Auditor-General. Tyler argued that the Auditor-General was responsible not just to parliament but to the public too:

> *'There are those that believe the Office of Controller and Auditor -General should report to the House and leave it at that. But I've always been of the view that my responsibility was to the people. It was them that I was reporting to through the agency of Parliament representing people. But in*

> *the ultimate it's people's money: they are the stockholders, and that's where my loyalty lies'* (Taylor 1992 in Jacobs 1998).

As such, Tyler developed the concept of VFM as a tool for Public Accountability.

In the UK with PFI's introduction, both policy concepts of VFM were reinstated by the Government (HM Treasury Taskforce 1998). In June 1997 the Bates Review recommended that the Treasury Taskforce should issue guidance on the way in which PSCs should be calculated, and bids evaluated for VFM. The Paymaster General accepted Malcom Bates's recommendation and decided that the new guidance should fully reflect the government's commitment to using PFI as a procurement tool whenever it enhances VFM when judged alongside other options. This policy decision makes the assessment of the relative VFM of such options a fundamental part of good project appraisal. As public procurement involves the expenditure of taxpayer's money, there is a constant need to ensure that the money has been spent economically, efficiently and effectively. Where it can be shown that money has been spent in this manner, it is reasonable to conclude that VFM has been achieved. The Taskforce Guidance concludes *'The achievement of value for money is a key responsibility of the Accounting Officer'.*

4.2.2 Public Sector Comparator

How and when does the Government apply the VFM test? The answer is stated in the HM Treasury Taskforce Guidance (1998a) on how to conduct the Preliminary Options Appraisal of Public Projects. It uses the "Public Sector Comparator" as a benchmark against which VFM is assessed.

According to the Taskforce Guidance (HM Treasury Taskforce 1999) on *'How to construct a Public Sector Comparator'* the PSC can be defined as:

> *A hypothetical risk-adjusted costing, done by the public sector as a supplier, to an output specification produced as part of a PFI procurement exercise. It:*
>
> - *Is expressed in net present value terms;*

- *Is based on the recent actual public sector method of providing that defined output (including any reasonably foreseeable efficiencies the public sector could make; and*
- *Takes full account of the risks that would be encountered by that style of procurement.*

The purpose of the PSC is therefore to provide a benchmark against which to form a judgement on the VFM of PFI bids. It is important to understand that Comparators are used in a variety of circumstances, one of which is the PFI procurement process. Also, however sophisticated the Comparator it is important to remember that this process focuses on factors that are not easily quantified and expressed in monetary terms. For example, a PSC, which is lower than a PFI bid, does not imply automatic rejection of the PFI. Consideration of the wider benefits (and costs) of accepting the bid may lead the Accounting Officer to conclude that PFI still represents best VFM, because of the transfer of risks which are not quantifiable and hence not reflected in the PSC.

In the context of PFI procurement, it is helpful to distinguish between two roles for which the PSC can be used (HM Treasury Taskforce 1999):

- As a management tool during the project;
- As a means of demonstrating VFM, when the contract has been signed.

According to the Treasury Taskforce a PSC should include:

- An overview of the project;
- An estimation of the basic procurement costs: capital costs, such as purchase, construction, project management (internal and consultants), and operating costs;
- A risk matrix – costs, likelihood of occurrence and consequences for the project;
- A discounted cash flow and the corresponding net present value of costs of the project;
- Sensitivity analysis, showing the consequences of varying key assumptions.

Figure 4.2 illustrates the steps in the decision process as whether to pursue or not the PFI route.

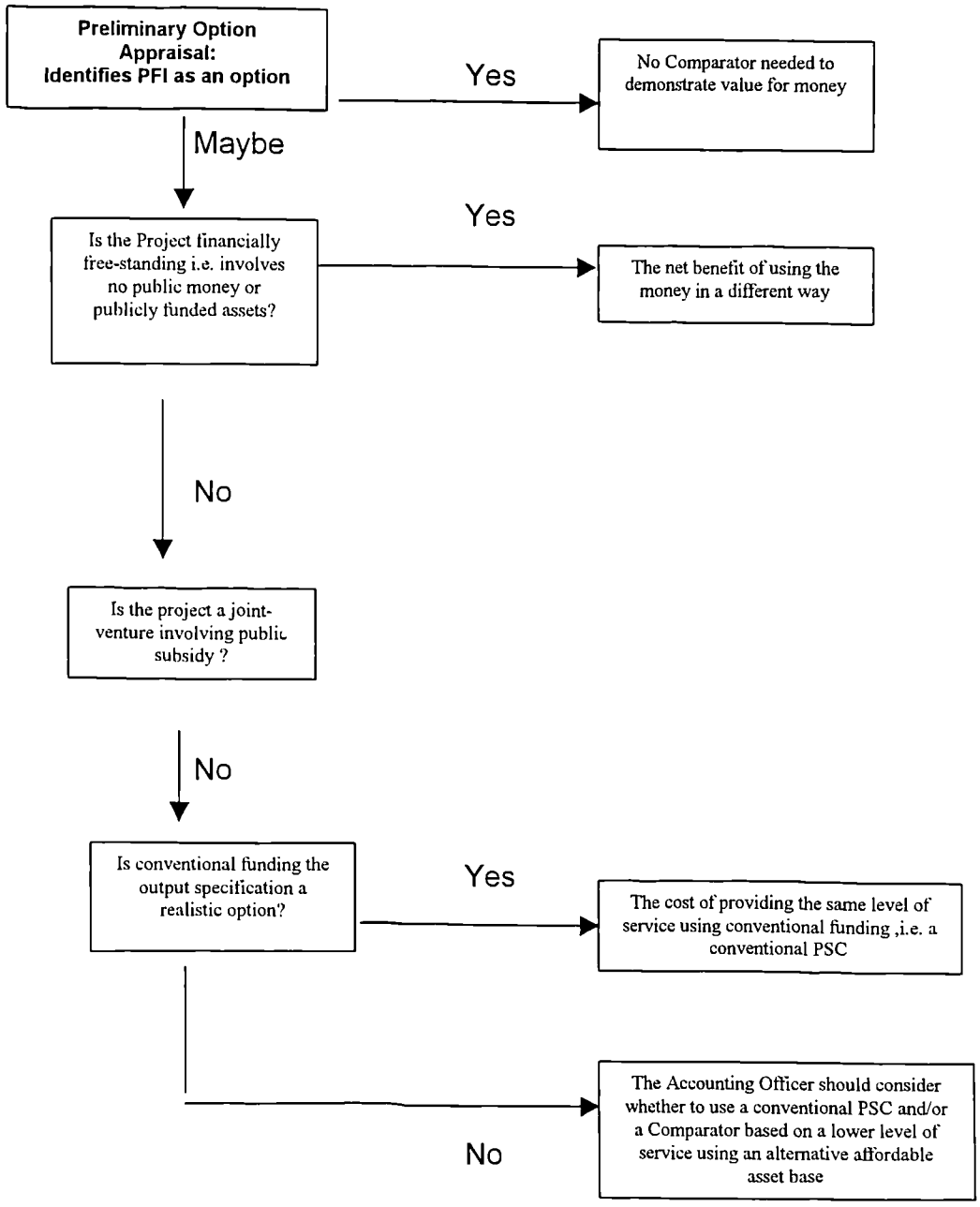


Figure 4.2. The Decision Process in a PFI

4.2.3 PFI Contract Model

A PFI is a free contractual relationship between the parties. As such, although there are guidelines and usual practices, every contract is unique. Each contract can have different features as long as all parties agree upon them. Nevertheless, to reduce time and costs involved in the bidding stage, standard documentation can be used as a basis for the discussion of contracts. The Taskforce published in September 1999 the PFI Standardisation Document.

The general mechanism for a PFI contract is shown in Figure 4.3. The main participants in the contracts are:

- *Authority* – Public sector party buying the service. It can be a department of central Government, a Local Authority, or a separate legal entity established under statute, such as National Health Service Trusts or the Passenger Transport Executive.

- *Contractor* – Counterpart of the Authority. A consortium that is an autonomous legal entity, totally independent of the companies that own it, commonly designated as SPV, with sub-contractors providing the actual performance on its behalf. It is the only entity that can establish contracts with the Authority;

- *Construction Sub Contractor* - The entity performing the construction/development obligations;

- *Operating Sub-Contractor* - The entity performing the operating/maintenance obligations;

- *Senior Lenders* – The providers of finance to the Contractor under a financing agreement, but excluding any shareholder or Affiliate of any shareholder in the Contractor. They provide the Senior Debt and can be banks, bondholders and/or monoline (that solely insures credit risks) insurers. When all those with a financial stake (including shareholders) are referred to, then the expression 'financiers' is used.

The PFI Contract is the main contract and is established between the Authority and the Contractor. The mechanisms to purchase the specific service are then established. It defines the service, identifies and allocates the risks and establishes the payment mechanism, among other clauses.

The complexity of the PFI contracts lies not only in the main contract between the Authority and the Contractor, but also in the other parallel contracts that have to be

signed among the private parties. There are basically four other types of legal agreements, which have to be signed in addition to the PFI main contract;

- *Contractor Contract.* This contract creates the SPV that acts as the promoter for the project. They usually are joint ventures of construction and operating companies including suppliers, vendors, etc. This agreement defines the new autonomous legal entity usually referred as the Contractor. It establishes their contractual relationships, the measures to control the breakdown of the consortium and dispute resolution procedures;

- *Sub-Contracts* between the Contractor and Sub-Contractors: the Construction Contract and the O/M Contract. Often there is another contract between the construction sub-contractor and the operator for building maintenance through the life-cycle of the project;

- *Loan Agreement.* The finance of the PFI is a mixture of equity and bonds, although it can take several forms. It is established between the Senior Lenders and the Contractor. Lenders are often commercial banks, pension funds or export credit agencies. This is the usual form of contract, but there are exceptions, e.g., prisons (HM Treasury Taskforce 1996) where the Senior Lenders also establish a Direct Agreement with the Authority if the consortium runs into difficulties, or fails to comply with its objectives. When there is outstanding debt it allows the lenders to change the construction company, operating or maintenance company, or indeed the consortium itself;

- *Direct Agreement* is an agreement between the Authority and Senior Lenders that deals with their relationship following a termination or threatened termination for Contractor Default (when there is outstanding debt). It gives Senior Lenders an opportunity to set up remedial actions, that can include the replacement of the Contractor;

- *Shareholders Agreement* typically between the Sub-contractors and Investors. Investors may include suppliers, vendors, financial institutions as well as private individuals. Investors provide equity to finance the project, the amount often determined by the debt/equity ratio required by lenders.

The final PFI contract is only established when all the other contracts are in line with it. The final structure of the contract has to make sense for all parties. To finalise it has to be remembered that each contract is unique and variations around the presented model

of contractual arrangements happen in each PFI project. Nevertheless, the alterations usually involve adding extra contracts keeping the basic contractual structure as the one presented in Figure 4.3.

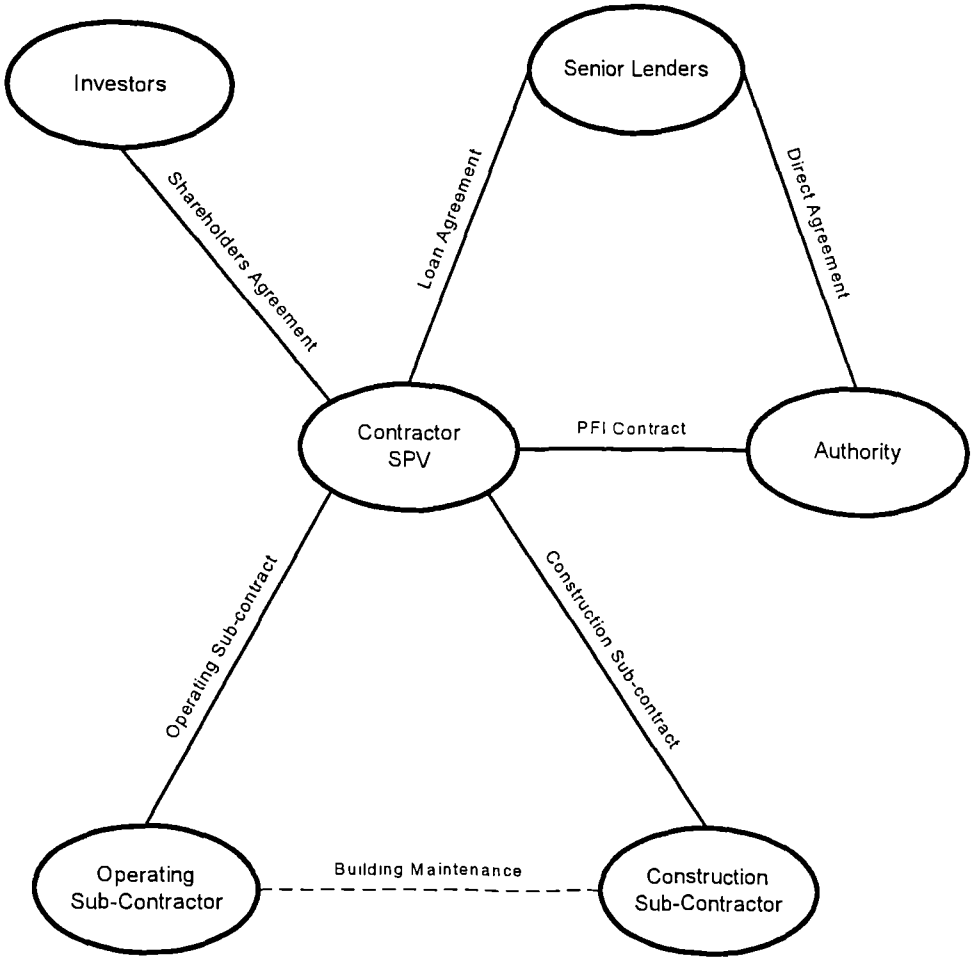


Figure 4.3. The Contracts in a PFI

Consultants (technical, legal, insurance) have ancillary contracts with all entities from the private and public sectors.

4.3.1 PFI Value Chain and Value Delivery Network

4.3.1 PFI Value Chain

The concept of value chain was introduced by Porter (1985). It disaggregates a firm into its strategically relevant activities in order to better understand the behaviour of costs and potential sources of differentiation. Every firm is a collection of activities that are performed to design, produce, market deliver and support the product/service. The value chain identifies nine strategically relevant activities that create value and cost in a specific business. The nine value-creating activities consist of five primary activities and four support activities.

Primary activities - Are the activities involved in the physical creation of the product/delivering of the service. In a firm primary activities can be divided into five generic categories: *Inbound Logistics, Operations, Outbound Logistics, Marketing and Sales, and Service.*

Support activities - Are the activities that support each other and the other activities by providing purchased inputs, technology, human resources and various functions: *Firm Infrastructure, Human Resources Management, Technology Development and Procurement.*

Linkages within a firm's value chain - Are relationships between how one value activity is performed and the cost or performance of another. Linkages can lead to competitive advantage in two ways: optimisation and co-ordination.

Vertical Linkages - These are external links to the firm and exist between the firm's value chain and that of suppliers and channels. There are two sorts of vertical linkages:

- *Supplier Linkages* between a firm's chain and the value chain of suppliers;

- *Channel Linkages* are similar to supplier linkages, but are referred to the linkages to value chains through which a firm's product passes.

The firm's value chain plus the one from suppliers, channels (distributors, customers), and the vertical links between all value chains is the Value-Delivery Network. Value is created not only within the company but also throughout the entire network.

Competition is therefore between networks, not firm's. The competitive advantage derives from the better network, not only from the firm's own value chain.

Activity Types - Within each category of primary and support activities, there are three activity types that play a different role in competitive advantage: *Direct, Indirect and Quality Assurance.*

Value chain analysis is a tool designed to emphasise firm's competitive advantage vis-à-vis its competitors. It is not suited for industries since it would be too broad and important sources of competitive advantage, and differentiation that can only be applied to a company will necessarily be obscured. Differences among competitor's value chains are a key source of competitive advantage. The firm's task (Kotler 1999) is to examine its costs and performance in each value-creating activity and to look for ways to improve it. The firm should estimate its competitor's costs and performances as benchmarks. To the extent, it can perform certain activities better than its competitors, it can achieve a competitive advantage.

The classic value chain is a static model designed to analyse one firm vis-à-vis its competitors, and PFI is a project (not a firm) that develops continuously through time. Therefore, the underlying assumptions of a value chain don't adjust 100% to the case of a PFI. Nevertheless, this concept is extremely useful to pinpoint the activities that create value. In order to use the value chain concept within a PFI, this study proposes to make two adjustments: first, it has to be assumed that a PFI can, in generic terms, be compared with a SBU - Strategic Business Unit and consequently with a singular company as it has its own individual inputs and outputs and one can measure its value creation; second, time has to be introduced as another dimension. New primary activities are introduced and others are phased out. Value is created throughout the development of the project. These two assumptions enable us to draw the PFI Dynamic Value Chain where the Primary Activities will be different from the classical Value Chain. The Support Activities will remain the same.

The PFI Dynamic Value Chain (adapted from Porter in Kotler 1999) is represented in Figure 4.4.

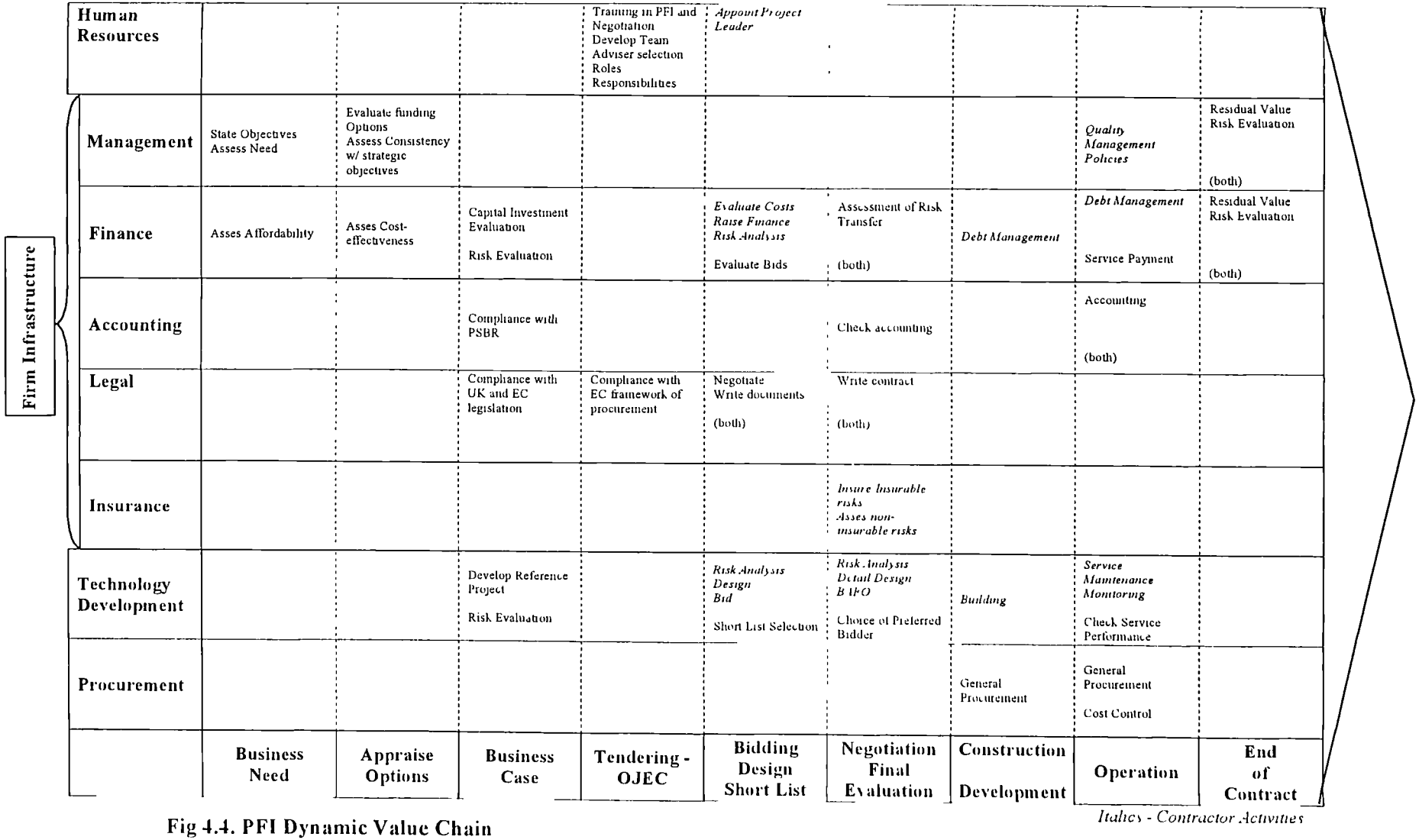


Fig 4.4. PFI Dynamic Value Chain

The **Support Activities** in a Dynamic Value Chain of a PFI are:

- *Human resources management*
- *Firm Infrastructure with the following activities*
  - *Management*
  - *Finance*
  - *Accounting*
  - *Legal*
  - *Insurance*
- *Technological Development*
- *Procurement*

The **Primary Activities** in a Dynamic Value Chain of a PFI are:

- *Business Need*
- *Appraise Options*
- *Business Case*
- *Expression of Interest*
- *Bidding Design Short List Selection*
- *Negotiation Final Evaluation*
- *Construction Development*
- *Operation*
- *Termination*

4.3.2 PFI Value-Delivery Network

The **Value-Delivery Network** encompasses the value chains of all the stakeholders. In a PFI project, there are numerous stakeholders involved in value creation, so the model of a PFI value-delivery network gives a better and clearer picture on how value is created, than just the representation of the PFI value chain. In a PFI value is dependent not only from the value activities performed within the PFI project, but also by the PFI related value activities performed outside the project.

Stakeholders of a PFI

- Authority
- Contractors
- Finance - Senior Lenders
- Insurance
- Construction Sub-contractors
- Operating / Maintenance Sub-Contractors
- Suppliers
- Users that generate return
- Users that don't generate return
- Technical consultants
- Accounting consultants
- Legal consultants
- Financial consultants
- Auditors (NAO)
- Statutory / Regulatory Agencies
- Environmental Issues
- Labour Issues
- Political Issues

Figure 4.5 presents the value-delivery network of a PFI project (adapted from Kotler 1999) with the stakeholder's value chains and their inter-actions. The bold arrows represent the most important connections that form the essence of the PFI contract. The dotted arrows are potential influences (that might occur).

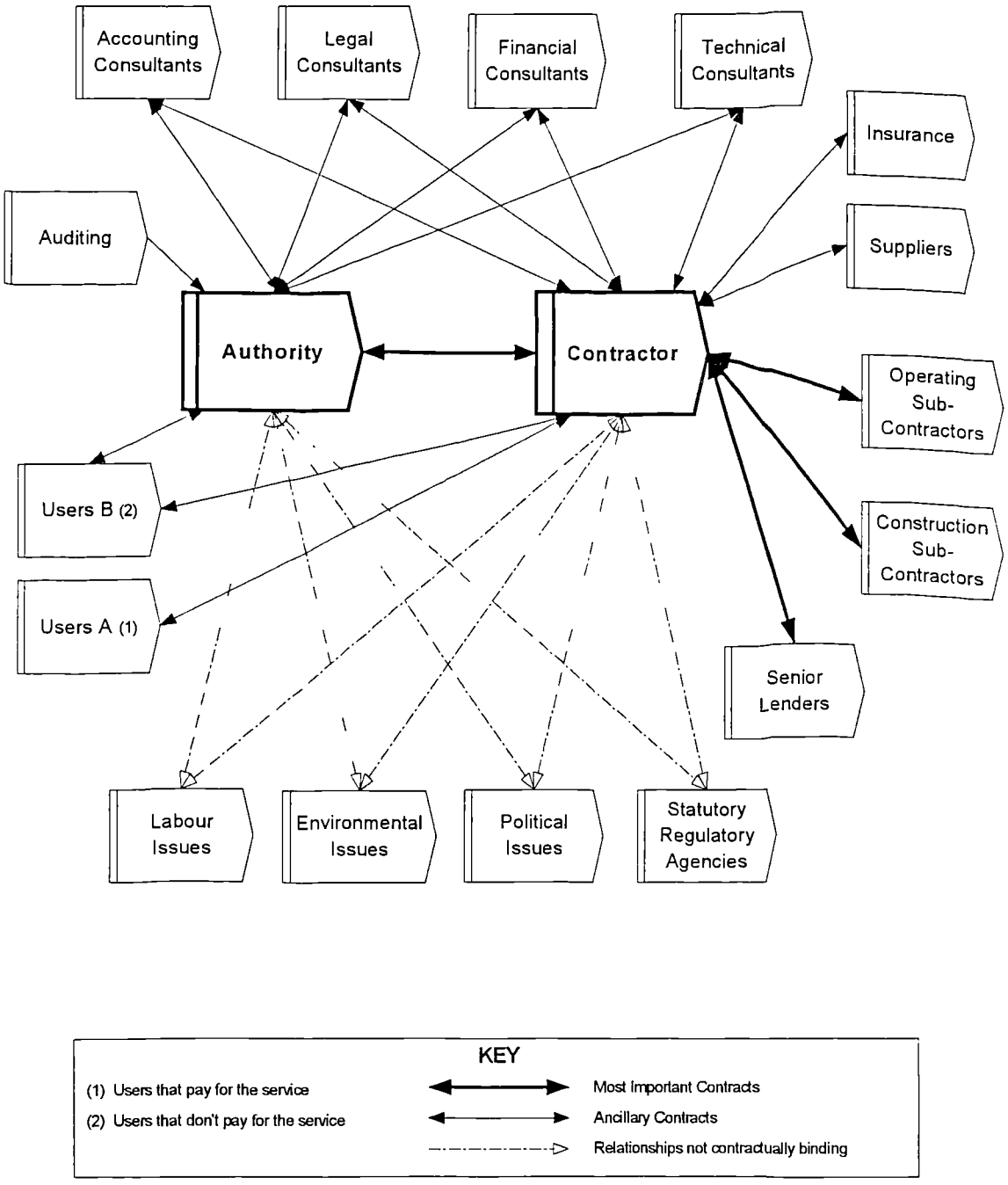


Figure 4.5. PFI Value-Delivery Network

The other arrows represent connections that are always present in a PFI but that are not part of the PFI contract itself. In the centre, we have the main players: the Authority and the Contractor surrounded by the other stakeholders that can influence one or both of the main players. For example, in Figure 4.5 several stakeholders influence directly

only the Contractor like Sub-contractors, Senior Lenders, Insurance, and Suppliers while Auditing only influences directly the Authority.

Although all the consultants are connected both to the Authority and Contractor, they are not the same for both. This simplified representation is chosen as to not to overburden the figure with the duplication of all the consultant's value chains. Regarding the users of the service two types are represented: *Users A* the ones that pay for the services, like toll-bridges, and *Users B* that don't pay for the service, the authority pays according to the usage rate of the service[1], like motorists in highways where the Government pays the shadow tolling.

The Value Delivery Network that is represented in Figure 4.5 can be considered only to be a simplified version. To have a full picture of how far the value chains interact one would have to consider for instance the value chains of the relevant professional bodies, and the externalities conveyed by PFI.

4.4 Life Cycle of a PFI

The life cycle of a project is the time span over which the project develops from the very beginning until the end. Based on the usual procedures in the development of a PFI a model is proposed that characterizes the various stages. It is important to assess the PFI's life cycle since a basic principle in a successful PFI is that it must be profitable on a whole life cycle basis. That is why life cycle costing has been one of the management techniques more developed in these projects. The project in itself is continuous but it is always possible to divide it into stages according to the actual developments that are taking place, the criteria being the similarities of functions undertaken and the stakeholders that intervene in each one.

The life cycle of a PFI develops through eleven stages (Figure 4.6). The establishment of a PFI project starts with the bidding process, continues with the signing of the contract, service provision and contract management, and ends when the contract expires. Clearly there is always the possibility that at the end of the pre-specified time for the provision of the service it will be again re-tendered and another contractor steps in.

The eleven stages are (HM Treasury Taskforce 2000):

1. Establishment of Business Need
2. Appraisal of Options
3. Development of Business Case
4. Expression of Interest
5. Bidding / Design / Short List Development
6. Negotiation [2] / Final Evaluation
7. Contract Award and Financial Close
8. Construction / Development
9. Operation (Servicing, Monitoring, Maintenance)
10. Contract Management
11. End of Contract

Now follows a brief description of the several phases. The first steps of bidding and contract signing are crucial since they state the conditions for the long-term relationship that is going to be established. Most importantly the contract's structure must clearly define the basis for the future long term operational and managerial relationship between the Authority and the Contractor:

1 - **Business Need** - In this stage the Authority assess the need for the service, the affordability of the project and the business objectives

2 - **Appraisal of Options** - All the options to carry on the project are appraised by the Authority: The scope of the project is clearly identified and assessed for its consistency with the strategic objectives. If the investment is expected to be affordable and cost-effective the analysis proceeds to Stage Three

3 - **Development of the Business Case** - The possibility of a PFI solution is explored. A clear definition of the service (output) to be delivered is done (not asset description) and a decision is made whether to consider a PFI funding type of project or not, by the Authority. A reference project is developed, or a PSC, where the capital investments, operation, maintenance, analysis of service time overruns and service under-performance costing is done.

[1] In PFI literature they are referred as 'Users that generate return' and 'Users that don't generate return'.
[2] The negotiation procedure can lead to a change in service requirements that were included in the original OJEC. This can lead to a *'judicial review'* when other competitors can claim that if those were the conditions they could have presented a proposal with better VFM. This happens often in the UK, e.g., in the accommodation sector, during a negotiation a land deal might be proposed which was not there in the first place.

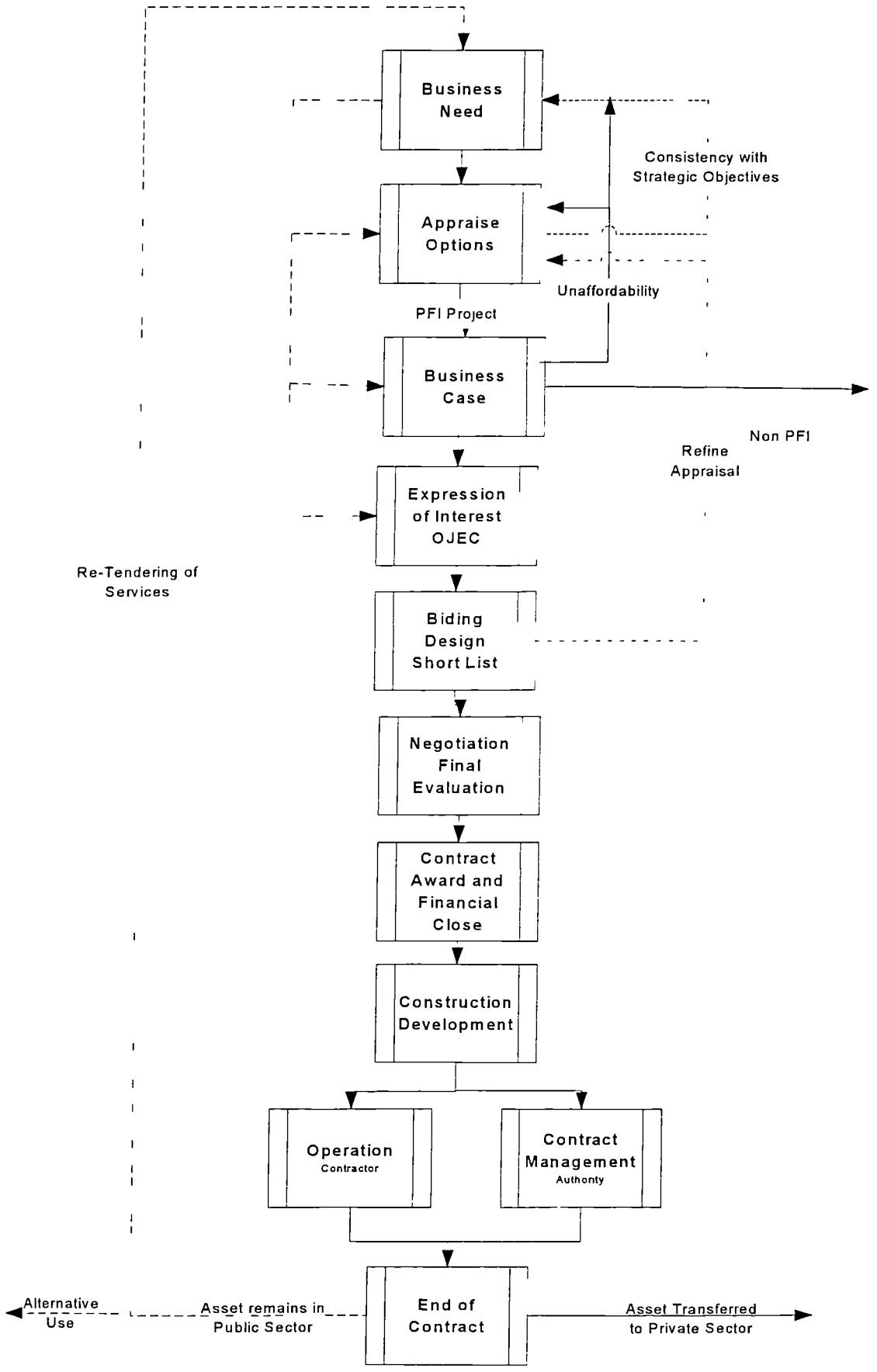


Figure 4.6. PFI Life Cycle

A complete risk analysis of the project is undertaken together with a preliminary evaluation and costing of the risks that will be transferred to the Private Sector. The project needs to be costed with sufficient reliability so that the service seems affordable on a year-by-year basis. It is necessary to undertake a comprehensive estimation of whole life costs and the identification/evaluation of the risks inherent to the investment. In special cases a preliminary market study is undertaken to ensure that there are adequate suppliers - sometimes a prior Information Notice appears in the Official Journal of the European Community (OJEC) to elicit potential expressions of interest of potential suppliers that will informally discuss the project.

If the PFI project seems unaffordable, return to stage 2: repeat the options appraisal. Readdress the need for the service and investigate other solutions until an affordable Reference Project is identified.

During this stage a project leader is selected and the PSC is checked by the financial consultants regarding to costs, by the legal consultants regarding to the compliance with UK and EU legislation's and by accountancy consultants regarding the compliance with the accounting norms.

Finally, the Government makes a decision whether to proceed with the project.

4 - **Expression of Interest** - In this stage the PFI Procurement Team is developed - It has members from the Authority, outside consultants and Internal Audit has also to be considered. It is very important to ensure that Senior Government Officials are committed and empowers the team. The roles, responsibilities are established, as well as timetables for when the fully costed proposals and the selection of the preferred bidder are due. Training in PFI projects and negotiation is often undertaken. It ends with the publication in the OJEC after checking its compliance with the EU's framework procurement method.

5 - Bidding / Design /Short List Selection - This is the first stage where the Private Sector is involved with the formation of the Bidding Consortiums. In the bidding process is also comprised the design, because to bid the design has to be established. The received bids are assessed by the Authority regarding financial strength as well as to technical approach and appetite for risk. These criteria form the basis for the short list selection. The funding commitment by the bidders is re-affirmed and the project is again checked for accountancy compliance. This stage ends with the refining of the appraisals. The first stage of the bidding process – short list – is also based on past

experience. In the early days it used to include some design but that has been discontinued to minimise costs.

6 - **Negotiation (Tendering) / Final Evaluation** - An invitation to negotiate is issued by the Authority after having established the negotiation strategy. The bidders proposals are evaluated mainly regarding the establishment of an innovative solution, that there is enough evidence that the proposed risk allocation is accepted by the proposed funders (senior lenders) and that the levels of financial commitment are realistic. At the end of the negotiation procedure the Authority might seek a Best And Final Offer (BAFO). From those the preferred bidder is chosen. The accounting treatment is reconfirmed. Finally the PFI is re-evaluated regarding its affordability and VFM.

In this stage and to ensure the success of the PFI, a complete and honest assessment of the consistency of strategies and strategic objectives of all participants, must be done before signing the contract. Unresolved conflicting interests are going to come up at later stages and their resolution will be much more difficult, and in the worst case scenario impossible.

7 - **Contract Award and Financial Close** – Detailed schedules must be completed on the project documentation, construction and operating sub-contracts must be drafted and financing documentation must be put in place. Contract award and financial close are likely to be simultaneous.

8 - **Construction / Development** – It is the contractor's responsibility. The term development issued since increasingly Information Technology (IT) projects are being developed through PFI type projects. Construction is applied to PFI projects in the construction area.

9 – **Operation** – It is the contractor's responsibility. It starts with the Service Commencement, and it comprises three operations: Servicing, Monitoring and Maintenance. Top management must set out a Quality Management Policy so that a Quality Management System will be in place.

10 – **Contract Management** – Contract management is an activity performed by the Authority and ensures that roles and responsibilities in the contract are understood and fulfilled. It is a distinct activity from the procurement process, and the Public sector must manage, and have guidance, to ensure delivery of the contract services, on how to deal with performance variations, and, if it applicable, to authorise payments. The long-

term relationship between the Authority and the Contractor must be ruled by two principles: Continuity and Knowledge.

11 - **End of contract** - The PFI contract specifies the provision of a service and has a pre-defined life span. When it ends there is the possibility that the asset is transferred to the private sector, or returned to the Public Sector. In this case the Authority has either an alternative use for the asset, or re-tenders the service. Prior to the re-tendering of the service there must be an evaluation of the Business Need.

The next sections present a brief discussion on these issues to help to clarify the context in which PFI develops, and provide a better understanding on the conceptual frameworks developed from Chapter 4 through to Chapter 7.

4.5 Key Issues in PFI

The shift from conventional procurement to PFI type of procurement brought about several issues that have to be tackled and understood by all the stakeholders involved. The issues range from the ones with a holistic nature like the organisational culture, to others like the structure of financing and risk allocation. Based on the empiric data collected and bibliographic sources (academic and non-academic) the issues that emerged within the current research as key issues in a PFI are:

- Change in Organisational Culture brought about by a move into the Services Sector, coupled with the need to deal with Long-Term Issues;
- Financing Structure: the balancing of debt and equity and the hypothesis of considering bond issues to finance senior debt;
- Risk Allocation between the public and private sectors.

4.5.1 Change in Organisational Culture

The public sector changes roles from the one of service provider and designer to service specifier and performance monitor. The private sector also changes roles from the one of an asset provider to a service provider. This focus on a service provision for an extended period entails a change in both public and private organisational cultures. They have to adjust to the move to the service sector, and to the commitment to very long-term relationships.

Figure 4.7 illustrates how a governmental project in a non-PFI environment would be conducted, and in contrast what happens in a PFI project. The private sector is involved for 3-5 years, and as it delivers the project its role finishes. The public sector will then operate and maintain the assets for the remainder of the life cycle of the project. In contrast, with a PFI project, the private sector will be involved for 20-30 years, finances and is also the service provider, operating and maintaining the facilities. The public sector role is to monitor service performance.

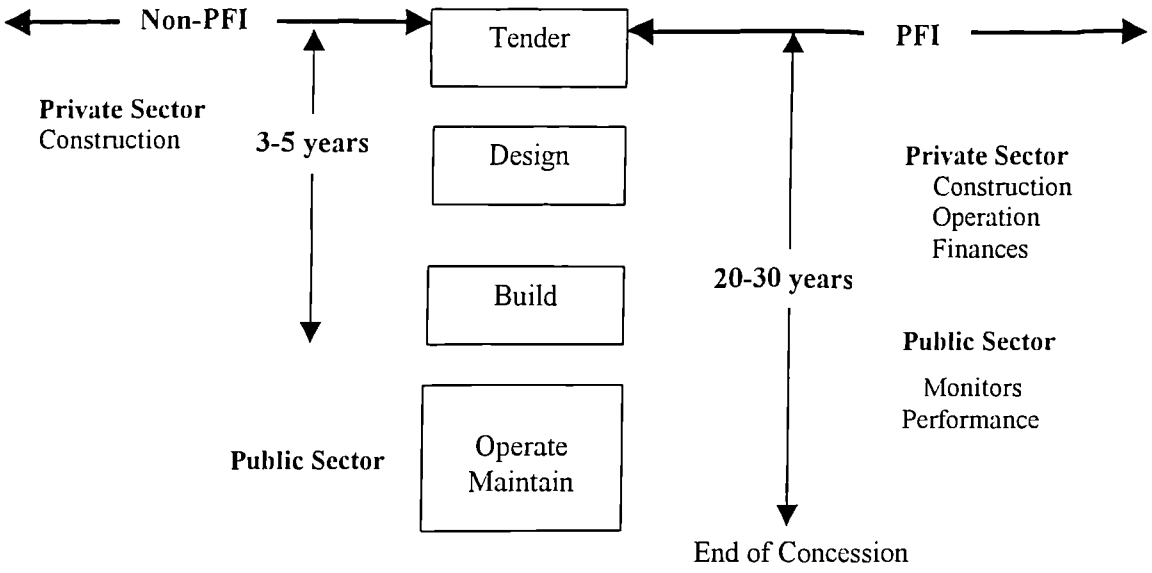


Figure 4.7. Public and Private Sectors Change Roles in a PFI

4.5.1.1 Move into the Service Sector

The main objective of a PFI is a service provision. This study considers it as a "*move into a new business*" as it a new way to serve your clients, with all the changes in company culture that it implies. The services sector is new for most of the private parties involved. For example, for construction companies that have equity share in the SPV it means a vertical diversification. They are no longer in the construction business but in the services sector. For operating sub-contractors PFI projects also imply a profound change in their approach to the way they operate. The payments are related to unusual performance measures of service provision, e.g. in custodial services the service provided is availability of prison space (the public sector retains the policies and actions related to individual prisoners). This availability is not only the physical space but includes a series of features like adequate staff levels, healthcare and food services.

Companies have to build and design buildings bearing in mind the adequacy of the asset to a specific service. For example, if food services are to be supplied they are defined by a given standard of food, rather than the need to build a specific kitchen.

In the public sector, PFI projects have also changed their usual ways of conducting a procurement procedure. The focus on requirements for service provision rather than saying how the service should be met, often through very detailed specifications, requires an organisational culture with an open-mind and flexibility to accept innovative solutions that might challenge established practices and procedures.

Design freedom was an important (HM Treasury Taskforce 1996) part of HM Prison Service's (HMPS) procurement approach. The private sector consortia are formed from a mix of construction companies, custodial service operators, facilities managers and other service providers. During presentations of bidders proposals, the influence of the operator on the design was quite apparent, reflecting not just the arrangements for looking after prisoners but also the implications for future maintenance. The best bids received were from consortia where the operators most clearly led the design team.

> *'Design freedom against an output based specification for the service requirement (i.e. defining what you want in terms of the delivered service rather than saying how the service should be met) is a fundamental feature of successful PFI projects, allowing the private sector to come forward with innovative solutions'* (HM Treasury Taskforce 1996).

There is still a limited experience on how to define criteria for the services to be delivered (Output Service Specifications) which are objective, easily measurable and monitored. Typically, output specifications are broadly divided into two categories:

- Services deriving from the underlying assets relating to their availability;
- Other services sometimes known as Secondary or "Soft services", like caretaking, catering, laundry, grounds maintenance, etc.

For example, in the case of accommodation (or prisons) availability is not only the physical availability of space but include also a set of services such as heating within specified temperature range, mail delivery, conditions of access, and lighting. Not only must the private sector supplier fail to deliver the service but it must also fail to remedy within a prescribed time before it may suffer remission from the payment it was going to receive. One of the objectives of establishing the Treasury Taskforce was the production of Guidelines and Standard Contracts to overcome, or diminished these problems.

4.5.1.2 Dealing with Long-Term Issues

Long-Term contractual relationships have inherent features related to long-term strategic decisions. It's also a relationship that has to be managed for 20-30 years and all aspects ranging from the human, technical, organizational are important. The SPV is an autonomous legal unit and can be seen as a new company with a pre-established life span of more than twenty years. This is a long period. Many companies don't last that long. It is estimated (IAPMEI 1998) that new businesses have a 70% rate of failure within five years of starting. All contractual relationships have to provide for this extended life of the contract, and establish measures (Cordova 1994) to prevent (control) the breakdown of the contract and establish dispute resolution procedures. These procedures range from litigation, arbitration or Alternative Dispute Resolution (ADR) to avoid litigation or arbitration that are costly. Private companies must adjust their organisational cultures to a long-term involvement instead of the past commitment only to short-term projects. Among the features that PFI stakeholders have to bear in

mind two are very important: It is vital to minimize whole life-cycle costs and to be aware that the return on investment for the private sector is long-term.

- *Minimize Whole Life-Cycle Costs* - A long-term relationship has its specific problems, and the financial incentives facing managers in many firms (Welles 1999) do not encourage them to evaluate long-term issues, short term benefits are much more attractive. In PFI the design and build of infrastructures has to be adequate not only to the immediate needs of the service, but also on a long-term basis where the long term maintenance and replacement costs have to be the optimised. By reducing maintenance costs whole life cycle costs may be minimised. The empirical data indicates that companies are already engaging in long-term planning of infrastructure design aimed at reducing both day-to-day and long-term maintenance costs (Annexes II and III address this issue). The design also favours flexible lay-outs adjustable to other future uses for the assets. This effort in turn fosters innovation, which is *per se* an objective of PFI.

- *When does the private sector get its return on investment?* The funding of a PFI is a mixture of equity and senior debt that has to be paid back on maturity. In a typical construction project companies and financing partners will be involved during 3-5 years as the physical completion coincides with financial completion of the project. When the construction phase is completed the sponsors receive their payment and the project ends. The SPV does not receive a singular payment at the end of the project as when in traditional procurement, but instead payment is raised by a continuous inflow of capital throughout the life of the PFI to service the debt and recover capital. The full payment for the investment of the private sector will only be achieved after years of service provision. It can happen that the project reaches financial completion before the end of the contract. For example, the Dartford-Thurrock Crossing concessionaire has until 2008 to recoup costs from tolls (DETR 1999), but as of 1999 they were expected to achieve their financial objectives by autumn 2001. There will be then an additional year of tolls to accumulate a maintenance fund. The crossing will then revert to the Government free of debt. In a Free-Standing PFI the public sector is responsible for the payment, and it seems reasonable that the payment risk, i.e., the risk that the private sector takes is relatively low. Governments usually pay their dues. Nevertheless in projects where it is the users that pay for the service there is an accrued risk of non-payment. A good example is the

Indáqua Feira project (Annex V) where the users connected to the water and wastewater systems pay directly to Indáqua. There is always the risk of payment default especially when people run into financial difficulties. The result is very often a costly collecting procedure sometimes involving court procedures.

4.5.2 Which is the Best Financing Structure?

The financing structure has to deal with two main issues: The balancing of debt and equity and the resort of bond issues to finance the senior debt

4.5.2.1 Balancing of Debt and Equity

The balancing of debt and equity is often difficult to achieve (Vives 1996) due to the structure of project financing deals, their risks and the incentives that guide the sponsors. The importance lies in the relationship of the ratio of equity to debt with the amount of risk the shareholders are willing to take, principally on a long-term basis. For example, low equity participation (Beato 1997) and control of concessionaires by construction companies might have contributed to the problems of the Spanish concession program between 1960 and 1980. It is argued that it was a mistake to allow companies to invest as little as 10 percent in equity. In effect, there may exist an incompatibility in incentives between the role of the construction company as a shareholder and as an input supplier. While shareholders attempt to minimise the cost of inputs, suppliers attempt to maximise it. In addition, shareholders recover their capital through long-term project cash flow, while a company that is both a shareholder and an input supplier may recover its investments in the initial phases of the project. In many cases, the leading sponsors, like construction companies or equipment suppliers, can recover their investments (Wells 1999) through upfront payments, subsequent profits are "cream", other partners or lenders bear most of the long-term risk.

In principle, (Vives 1996) equity should be provided up to the point that the debt service can be consistently supported by the project's cash-flow under a variety of events, while allowing an adequate return to shareholders. There are schools of thought that advocate (HM Treasury Taskforce 1996) that the more equity injected the more commitment the sponsors have. Nevertheless, the consequent effect on the potential weighted average cost of capital for the project should be borne in mind. Generally speaking, equity being unsecured is more expensive than debt. As the prisons have shown, the incentive for delivery and continuous improvement can be provided for under the contract (and the bidding-negotiation procedures). Typically, a PFI–SPV (Brown 1999) is capitalised with a combination of 10%-30% equity (or equity subordinated debt) and the balance as senior debt. The senior debt can be financed either by bank funded project loans or bond issues.

4.5.2.2 Bond Issues to Finance Senior Debt

In project finance each project requiring financing resources has its own specific characteristics, that is, each financing package is unique like the sources of financing, debt restructuring, or refinancing. The question is when to resort to bond financing. Anthony Forshaw, director of infrastructure finance at Deutsche Bank, says that with the continuous innovation in bond issuances, the capital market's role will continue to grow *"Bank debt is still the more dominant form of funding – mainly because bond deals are more viable only for the larger deals, but capital market funding has a significant role to play if bond issuers continue to get more creative"* (Financial Times 1999e).

The UK has a privileged position in the international banking services, which is an advantage to the financing of projects. The City of London (Stanton-Ife 1999) has 500 banking institutions, of which 200 take part in project finance. Overall 2/3 to 3/4 of senior debt is financed from traditional bank loans, and approximately 1/3 is financed from bond issues that are increasingly more common due to the good acceptance by the capital markets. Bond issues are also becoming more innovative, for example the £91.2 million bond issue maturing in 30 years issued by Meridien Hospital for the redevelopment of the Greenwich hospital in south-east London, was the first hospital

bond to be issued, and successfully closed, *"unenhanced"* or *"unwrapped"* that is without credit enhancement (unguaranteed) from a bond insurer. A triple A monoline credit insurer can wrap-around a bond issue, and guarantee or credit enhance the payment of the principal and the interest of bonds.

In the UK (Financial Times 1999c) PFI projects are already using domestic bond issues as an important source of funding, and several funds specialise in financing PFI projects. For example, the Innisfree Fund (European Venture Capital 1996; Jury 1999) the first dedicated PFI fund, was launched in 1996 and raised £150 million to fund PFI projects both in the UK and in Europe. The Innisfree Fund is a mixture of equity and fixed-income assets and expects to deliver annual returns of between 12 and 15%. This type of funding will inevitably introduce a much more rigorous evaluation of the project risk.

Bond issues can be complex and expensive, but they offer access to the wide range of resources of the capital markets. In principle, to be cost effective, bond issues are better suited for medium (over £50 million) or large projects (over £100 million). Schroders and the Rotch Property Group (Project Finance 1999) are studying the launch of a Eurobond issuance programme of up to $1.6 billon to help finance medium-sized PFI type projects that have had financing problems. Future European projects (Financial Times 1999c) could also be funded by euro-denominated bond issues.

The trend for the increasing usage of bond financing is favoured by the trend to bundle small PFI projects, to promote efficiency and to minimize bidding costs. For example, local authorities group several schools and offer the package for tendering, as with the £1 billion contract (Financial Times 1999d) to integrate the provision of information technology access and the repair, rebuild and maintenance of Glasgow's 29 secondary schools. Consequently, a question mark is raised as to the future trends of the size for a typical PFI project. It looks likely that the more probable scenario will be that the PFI market will consist of medium and large PFI projects, consequently with the senior debt funded by bonds.

Other issues not directly related to the PFI market can affect PFI bond financing. The success of PFI bond issues can be fostered, or hampered, by conditions that are external to the PFI market. Investment funds which currently are very active in the bond market, could the economic conditions deteriorate would withdraw, with dramatic consequences for the bond market and consequently with devastating consequences to the debt service of the PFI. However in the present market conditions there is a different scenario: The

UK Government has not been issuing debt at the levels it used to (more private investment through PFI) so there is shortage of long-dated government bonds - 15 or more years to maturity. As such, the market reacts very favourably to the issue of long-term bonds by the private sector. For example, the issue of the then largest ever, £137.4 million index-linked guaranteed bonds maturing in 2031 for the rebuilding of the South Tees hospital on 11 August 99 (Financial Times 1999a). Early in 1999, an index linked and insured bond was issued to fund a £67 million hospital at Bishop Auckland, County Durham. In conclusion, the private and government bond market has to reach equilibrium so that the shortage/excess of risk-free government debt doesn't affect negatively the private bond market.

4.5.3 Risk Allocation between the Public and Private Sectors

One of the fundamental beliefs that are the essence of PFI is an optimised transfer of risk from the public sector to the private sector, that is the party best placed to manage and control some of the risks. This brings efficiency and effectiveness to the project, and the public sector benefits from the skills of the private sector. In the end this leads to better VFM, and the public sector can be confident that it is using public funds in the best way.

This scenario is the objective of every PFI. To achieve it is not easy. There are lengthy and difficult negotiations on risk allocation prior to the signing of the contract. Essentially what the public and private sectors are doing is setting up the Risk Management framework for the PFI project. Experience has shown that this process has improved with time, as all parties are more familiar with the procedures. Also, as more sectors are brought to the PFI arena, a broader range of issues is covered and the lessons learned can be used in future projects.

Risk management in PFI projects is extensively discussed in Chapter 5.

4.6 Delivering Variability in Projects

A PFI project is unique, but it is inevitable that there are features common to certain groups. The research provided insight on the similarity (and variability) of PFI projects when classified according to the promoter's size, the sector and the international context.

A discussion of the research findings on these three topics follows:

4.6.1 Promoters Size

Some concerns have been raised that Small and Medium Enterprises (SMEs)[3] are being left out of the PFI market due to the dominance of large companies. As an example, in Germany the Ministry of Finance (Christen 2001) of the State of Rheinland-Pfalz presented the endangering of SMEs as a contra-argument to the utilisation of PFI as a procurement tool due to the conflict between the application of the VFM concept and measures for SMEs protection. In view of the importance of SMEs in the national economies, this is a key issue with a great socio-economic impact. The scope of the current research excluded the detailed analysis of the influence of company size on PFI development. Nevertheless the research has provided some insight on this issue (Annex Viand sec.8.3.2). It is then possible to have an overview of the SMEs positioning in the PFI market and to draw some recommendations regarding the relationship between SMEs and PFI projects.

4.6.2 Differences Sector Wise

The applicability of PFI has steadily been extended to a great number of sectors, diverging from the traditional concessions like infrastructure projects, thanks to the

[3] According to the European Commission SMEs are all private enterprises with: Less than 250 employees <250; Turnover =< 40 Million Euros, or Balance Sheet =< 27 Million Euros; and pass the Independence criteria: >=25% of

notion of service provision. The number of sectors where PFI projects are undertaken is vast: Transport - Roads, Bridges, Rail (Metro & Light Rail), Hospital Services, Custodial Services, Housing - Provision of new houses and management of existing ones, Schools - Refurbishment, repair and maintenance, Accommodation Services, Management of Waterways, and IT projects. The nature and characteristics of the services they provide are very diverse, and the performance and development of PFI is very different across the sectors.

4.6.3 Cross Border Variability - The International Context - Portugal

In Portugal there is a great need of infrastructure investment, but the prevalent political will doesn't favour the systematic use of private funding [4]. *'It almost seems that it has to be hidden'* [sic] was mentioned during an interview at Bank Efisa. Also there is no governmental unified policy and it is clear from all the collected empirical evidence that a strong and unequivocal political will determine to a great extent the success or failure of a PFI project. The Ministries are autonomous and each one states the terms of the tenders. For example, St[a] Maria da Feira Municipality, the Authority in the Indáqua project, suffered the consequences of lack of Decision Power and of Empowerment in the governmental system. On one hand only Local Authorities had the power to award the concession, but on the other hand they could not minimally control the decision power that derived from central government directives. An important lesson to draw is not to sign contracts for which they don't have to rely on future decision, as it was the case where there was no firm (written) commitment from the Central government to allow the Municipality access to EU funding.

In Portugal there is a different approach to the PFI methodology from the one that was established in the UK. In Portugal the VFM criteria is not applied, and the decision whether to undertake the project, is based on purely political, economical and financial conditions of PFI as a stand alone project not in comparison with a benchmark such as the PSC. Similarly to the UK there should exist an evaluation of VFM, ensuring that the project is less costly than when compared with the government's traditional

equity cannot be owned by any company that cannot be qualified as a SME (except investment or venture capital companies not exercising control).

[4] There are several concessions that don't include construction, like the Hospital Amadora Sintra.

procurement. This would help to reduce some perception in the political and media environment that a PFI is more costly and that the State is pawning future generations income.

In contrast with the UK the existence in Portugal, but not in the UK,[5] of significant EU funding was a determinant to the launching of infrastructure projects. The same applies to the European Investment Bank's special financing conditions. In Portugal there are two very important legal/regulatory restrictions regarding financing: first, the Code for the Commercial Societies doesn't allow bond issuance of societies with less than three years of existence, and only up to an amount of the society's equity; second at a fiscal level there are some taxes that don't exist in the UK, e.g. *'imposto de selo'*.

There is a negotiation procedure with two bidders (no short list or preferred bidder). After the selection it takes 2-3 months to establish the SPV and draft all the other contracts. Similarly to the UK all contracts have to be established at the signing of the contract (inclusive the risk transfer to the insurance companies).

In contrast with the UK where the Treasury Taskforce has published a series of UK PFI case studies, in Portugal there is no tradition to learn from past cases. Whenever a past experience is used, it is only to copy without critical analysis. This can lead to disastrous results as in Tavira where they copied a contract. After bidding started the tender had to be suspended, because the contestants started asking for clarifications that could not be adequately answered. Finally it was cancelled.

A common criticism both in Portugal and in the UK is that sometimes (more often in small projects) the public partner doesn't provide sufficient information and doesn't have a clear idea of the objectives, before issuing the tender. Consequently this over-extends the negotiation period, like Indáqua (Annex V), or creates problems in the construction schedules like in the Joint Services Command and Staff College - JSCSC (Annex IV).

Due to importance of the construction sector in the PFI market there follows a brief characterisation of the sector in Portugal and the UK. This permits a better understanding of the issues that can be raised when dealing with cross border PFI projects

[5] Some EU funding is available in the UK.

4.6.3.1 The Construction Sector in Portugal and UK

The construction industry' structure is very different in the UK and Portugal. In the UK there is the more widespread usage of management techniques like value chain analysis and risk management, and the governmental regulatory policy has been adjusted to the PFI specific needs, like for example the accounting standards.

The construction market in the UK is larger (in terms of business volume) such that a large project such as bridge or a shopping mall doesn't have the same impact as in Portugal where any of these will represent a large slice of the market. Similarly the impact of public works is much greater in Portugal than in the UK, which gives Portuguese companies a strong political power. For example Kvaerner that integrated the Lusoponte consortium was very active at providing technical expertise and know-how, while Portuguese companies provided key political connections and access to local suppliers.

In the UK the construction market is more fragmented (about ten very large players and fifty large intermediaries) than in Portugal with an oligopoly where a reduced number of very large companies controls the market. Within the Portuguese construction sector there are more than 30 000 registered construction companies that account for about 7% of the GDP and employ 9% of the country's total workforce. There are more large companies in the UK although their relative weight is smaller than in Portugal due to the larger dimension of the construction market. The large companies in the UK are usually vertically disintegrated sub-contracting the design, quantity surveying etc, while in Portugal the large companies have their own in-house competences recurring to sub-contracting only in very large projects. The structure of the Portuguese construction sector (IAPMEI 1998) – distribution of companies by number of employees and business volume - is very similar to the average structure of the European Union.

The main problems in the Portuguese Construction sector (IAPMEI 1998) can be grouped in the following areas: Lack of: Adequate Human Resources, Innovation, Investment and Productivity, Management and Organisation Abilities, and very importantly the overall fiscal, regulatory and governmental policy is not favourable. These factors provide a somewhat negative picture for the future of construction companies. The overall tendencies point to the increased weight of large projects that require private funding, using sophisticated techniques of financial engineering, and the

opening to the private finance initiative of sectors, like water sanitation, transport, etc, that require large infrastructure projects. These developments place the construction groups in a privileged position to diversify their activities and minimize the effects of the economic cycles that always affect the construction industry but only the companies that are prepared for it will profit.

There are cultural differences between the two countries. In the UK it is assumed that a contract is a definitive document while in Portugal, the prevailing attitude is that re-negotiation is always an option, leading to great waste in time and money. Companies and owners of the projects have a tradition to revise construction contracts introducing extra-works that are carried out without tender. In Portugal there is still a lax attitude towards the enforcement of regulations, while in the UK companies strictly abide by the regulations including those from the EU.

The Portuguese companies are very interactive, with an informed network and are much more flexible than in the UK. This was not happening in the UK with a very fragmented industry where the different partners were doing what they wanted. As PFI forces interaction it is noticeable that this has changed and the integration of the different companies value chains is a great concern of the industry especially because it is so vertically disintegrated.

Other cultural differences between the UK and Portuguese construction sectors refer to the social environment. According to *'A Review of Procurement and Contract Management for the EU'* (Eaton 2000), the European national construction industries can be classified according to their cultural, ethical and legal similarities:

- UK and Ireland integrate the *'Common Law Group'*;
- Italy, Spain, Greece and Portugal integrate the *'Mediterranean-Romano Group'*.

The groups are characterised as:

Common Law Group – The countries have a strong common law history, providing clearly defined and definitive legal traditions and legalistic process. There is a predominance of separate and independent professions. The main contractor significantly dominates total national output, and therefore, a strongly organised and extensive network of sub-contractors and specialists exists to assist. There is a division of legal responsibility, derived from the separation of design from construction. The

basis of competition tends to be based upon price and speed (or a combination) rather than quality of output;

Mediterranean-Romano Group - In these countries quality is less emphasised, but might be exceptionally good. The public administration of planning and development is notoriously slow, and is characterised by 'expensive' regulatory mechanisms and the entire administration of procurement and management of projects is bureaucratic and highly politicised. The cultural attitude towards innovation is also different. Portuguese construction companies are less keen to innovate with very often a high degree of resistance to change. A contributing factor being that a significant number of companies is family-owned. In contrast, UK companies tend to envisage innovation as a central factor for competitiveness.

This Chapter proposed a definition and conceptual framework for PFI, and described some features of the PFI market. Next follows the proposal for a dynamic model of Whole Life Cycle Risk Uncertainty Management for PFI projects (Chapter 5), a proposal for the model on PFI's Critical Success Factors (Chapter 6) and in Chapter 7 is discussed and proposed a model for PFI's Sustainable Competitive Advantage.

CHAPTER 5

PFI Whole Life Cycle Risk Uncertainty Management Model

5.1 Introduction

> *"The key objective of public sector procurement is to ensure that taxpayers get VFM. This requires that public service clients should ensure that economic appraisal, including a proper appreciation of risk are applied rigorously and that risk is allocated between the public and private sectors so that the expected VFM of the services provided to the public is maximised"* (HM Treasury Taskforce 1999). *"The identification, allocation and management of risks have grown to become an essential part of the PFI process"* (PRAM 1997).

This chapter proposes a dynamic model of whole life cycle risk uncertainty for PFI projects. It was conceptualised and developed based on the empirical data collected. The model presents a clear picture on how uncertainty progresses throughout the whole life cycle; it is comprehensive, doesn't underestimate the risks avoiding the wishful thinking attitude that often prevents the adoption of correct risk-management measures.

The whole life cycle model of risk uncertainty can be quantified and used to classify projects according to their degree of uncertainty and maturity. It is innovative as it recognises that uncertainty is dependent simultaneously on the particular risk and on the period of the project's life cycle. This model is also a powerful tool for structuring strategic decisions.

5.2 Definitions

5.2.1 Risk and Uncertainty

Risk underlies everyday events, in that no one can forecast with complete accuracy what is going to happen in the future. If the outcome of future events could be predicted with absolute exactitude, there would be no risk. Every outcome, good or bad, would be certain. In every day life, the term risk means something that is both uncertain and undesired, as implied by its origin: risk derived via the French *risque*, from Italian *rischo*, from *rischiare* "to run into danger" (Encarta 2000). Yet, Bernstein (1998) considers risk from a less negative perspective. In his detailed account on the origins and history of risk, risk is considered *'a choice rather than a fate'* as he considers that the term risk derives from the Italian '*risicare*' which means 'to dare'. He concludes that all the mathematical developments that permitted the quantification of risk helped to transform the perception from chance of loss into opportunity for gain.

It was mainly through the applicability of risk in the insurance (Williams, Smith & Young 1998) and banking (Bessis 1998) sectors that risk became associated with the concept of probability of occurrence of an event, and hence the notion that the outcome can also be better than expected, removing the association with something always going wrong.

As such, the notion of risk in itself is highly subjective. What is an acceptable risk for some people might be completely unacceptable to others. It all depends on their respective tolerances for risk: some people are risk averse while others are risk prone and can view risks as opportunities, not threats.

A definition of risk must be simple, straightforward, and account for the possibility that the outcome can be either better or worse than expected, even though in everyday life the term risk implies that something is both uncertain and can be undesirable. The definitions of risk-related concepts adopted in the research are based on the heuristics[1] of accepted practices of project risk management, as well as the definitions of Covello (1993), Smith (1999), Raftery (1994), PRAM (1997) and Edwards & Bowen (1998).

1 *Heuristics* - Rules of thumb that usually lead to the correct solution but are not guaranteed to work all of the time. Encarta.

The risk definition adopted in the current research is:

> ***Risk*** *- A characteristic of a situation or action wherein two or more outcomes are possible, the particular outcome that will occur is unknown, and at least one of the possibilities is undesired'* (Covello 1993).

This definition of risk has the advantage of being consistent with the way people think about risk in everyday life, but is more comprehensive because it accounts for the possibility that the outcome can be better than expected. For PFI, the Treasury Taskforce (HM Taskforce Guidance 1999) adopts an accounting definition of risk, which is coincidental with this one, but goes a step further emphasising the cost of risk. It states:

> *Risk is uncertainty as to the amount of benefits. It includes potential both gain and exposure to loss'* (HM Treasury Taskforce 1999).

Risk is a concept with two-dimensions, both presenting the duality between the Known and the Unknown. The risk dimensions are the characteristics (plus timing and magnitude) of the event, and the probability of occurrence. Both the event and probabilities of occurrence are usually based on historic series of statistical data or, in special cases, on expert opinions.

Risk is often related, referred or used with another concept: **"Uncertainty".** In risk management, risk and uncertainty are often used interchangeably, but that can lead to misleading reasoning's or interpretations. Peters (1999) in his work on the unpredictability of financial markets affirms that it is crucial to distinguish between risk and uncertainty. Otherwise there will be no progress in the understanding of complex systems such as the economy. Morgan and Henron (1990) present the opposing view that for real-world decision making the distinction between risk and uncertainty renders the probability theory virtually inapplicable. This view is obviously limited to the methodology the authors use for analysis and prevents the development of new models more adjusted to reality. Thereafter, in this study risk and uncertainty are considered to be two different concepts, uncertainty being one feature of risk.

> ***Uncertainty*** *- can be considered as a feature of risk of an event where the probability of occurrence is not known, hence it cannot be quantified* (Smith 1999).

To clarify these two concepts Table 5.1 relates the characteristics of Events and their Probability of Occurrence and shows how the same risk can present different levels of uncertainty.

Table 5.1. Uncertainty attached to Risk

Event / Probability Occurrence	Known	Unknown
Known	Risk with **No (or Low) Uncertainty**	
Unknown	Risk with **Uncertainty**	**Maximum Uncertainty**

A Known Event with a Known (reasonably) probability of occurrence is a Risk with No (or Low) Uncertainty attached to it. But in contrast, a Known Event of which we don't know the likely probability of occurrence will be a Risk with High Uncertainty.

5.2.2 Risk Management

Risk is a pervasive element of everyday life. To deal with it effectively, risk-based considerations must be integrated into an analytical framework like Risk Management (RM). As such, the ultimate objective of any RM exercise is to identify, mitigate, reduce, and, if possible, eliminate risks.

> ***Risk Management*** *- It is a systematic approach for dealing with risk. A risk management system: establishes an appropriate framework; sets goals and objectives; identifies and analyses risks; influences risk decision-making; and monitors and reviews risk response; identifies, selects and implements appropriate actions to control risks, and is supported by the information gathered in risk analysis* (based on Covello 1993 and Smith 1999).

Good Risk Management is central to PFI success. It aims at identifying all the risks involved in a PFI project, to calculate the financial consequences, to establish mitigation procedures and to allocate the risks to be transferred to the party best able to manage them. RM is an interdisciplinary process, where all stakeholders (or their representatives) are involved, including the ultimate users of the asset/service.

When a risk is identified, there are several options available to decision makers:

- **Elimination** – To implement measures that can *remove* a particular risk;
- **Avoidance** - Different procedures to *keep away* from particular risks;
- **Reduction** – To implement measures that can *lessen the adverse effects of risks*;
- **Transfer** – *Give management responsibility* of the risks to other parties;
- **Absorption (retention) of risks** – To *keep management responsibility* of the risk.

The two last options – transfer and absorption – are usually combined in a procedure named Risk Allocation. For example, in a project involving several parties, before the actual start of the project, all identified risks are reviewed and the responsibility to manage each risk is assigned to a specified partner. In principle, the risk should be allocated to the partner best able to control and manage it. The decision of the allocation must be done jointly and through a negotiated procedure, so that all parties are willing to accept their share of responsibility in managing the risks. Then, if elimination of the risks is impossible, mitigation measures can be identified to minimise the adverse effects. Risk Allocation can also include the option of Risk Sharing, where two or more partners decide to jointly manage pre-defined risks.

If risks are dealt with *a priori*, the project will have some risks eliminated, other risks reduced, and the remaining risks with mitigation measures already in place. There is always the possibility of unidentified risks occurring, but then measures have to be agreed upon on how to proceed, usually involving a renegotiation of risk allocation[2]. It is important to stress that the first Risk Allocation exercise is a procedure that takes place before the actual start of the operational stage of a project, and that to simplify

2 *Validate* - All parties have to confirm that the risk is to be considered and accepted as such.

procedures, risks are first classified into global categories, in a top down approach. In these global categories are included Force Majeure events - events over which the parties have little control, but that can have serious impact on the project, like wars, nuclear explosions, earthquakes, etc. A Force Majeure Event usually implies the termination of a project.

To improve the probability of a successful project, RM must not be considered optional – it must always be done. It enables the project manager to act after consideration of the risks, and mitigation procedures can be considered in a non-stressful environment before the actual operational stage. In addition, it is possible to recognise the potential consequences of accepting the risk. In principle, decisions that are more effective are achieved, as the approach to RM is proactive rather than reactive/crisis management.

RM in long-term Projects, like PFI projects, is critical to their success. These projects develop over the course of 20-30 years, and necessarily, the social, political, economic and financial environment change as well. Consequently, the risks and the assumptions that were the basis for decision-making also change. If the risk management process is not adapted to this changing environment, and corrective measures are not put in place, the chances of something going wrong are high, possibly compromising the viability of the project. It is likely that when new risks appear (or change), they are left unmanaged, or not adequately managed. Then the corollary of Murphy's Law applies *"If something can go wrong, it will go wrong, and at the worst possible time"*.

The next section proposes the Whole Life Cycle Risk Uncertainty Management model.

5.3 Whole Life Cycle Risk Uncertainty Management model - WLCRUM

In PFI, the public sector transfers risk to the private sector that must raise the capital, manage and operate the project, and maintain predetermined specifications for providing the service. As a result in PFI, there is a multitude of risks. In this research it is

considered that the most appropriate classification uses a top-down approach (Smith 1999) analysing first the global risk[3] categories and only then the elemental[4] risks.

The WLCRUM model is therefore limited to global risks - those that can affect the economy or one sector as a whole. Elemental risks are project-specific and can be analysed with a similar methodology. The two criteria used in this research to classify global risks in PFI are: first the type of risk, and second the type of stakeholders involved – private or public to allow a separation of Regulatory and Legal Risks. As such, the global risks in PFI are:

- **Political and Regulatory Risks** originating within the public sector, such as will of government, change in law, price controls, labour regulations, other actions of regulatory agencies, and Ultra-Vires;
- **Economic and Financial Risks** related to the development of the economy such as Inflation, Interest Rate, Foreign Currency Exchange Rate and Funds Availability;
- **Social Risks** originated by protestor actions or collective actions, for example, environmental groups or local residents associations;
- **Legal Risks** that are the responsibility of the private sector like Breakdown or Insolvency of consortium;
- **Bidding Risks** inherent in the negotiation procedures like unsuccessful bids;
- **Design Risks** that arise when the desired level of performance or quality in service provision is not reached, even if the project is constructed satisfactorily to the specifications of the project;
- **Construction Risks** that prevent physical completion, for example, Cost and Time Overruns, and related warranty repairs caused by poor building work after the asset has been completed (latent defects). A subcategory of risks external to the construction process but included here consists of the risks not directly derived from construction, like ground condition, archaeological findings, and site availability. These can delay or even prevent construction completion;

3 *Global* – It includes all risks that affect all projects for a particular sector, like the ones derived from changing economic and regulatory conditions.
4 *Elemental* – It includes all risks specific to the project, for example, some of construction risks.

- **Operational and Maintenance Risks** such as penalties for Under Performance, Non Availability, and the risk that costs will be greater or less than was expected specifically because of changes in price;
- **Commercial Risks** that affect the commercial performance of the PFI such as Demand Risk, the risk that the demand for the service will be greater or less than the level predicted or expected, and Payment Risk, the risk that the service will not be paid for;
- **Residual Value Risk** that at the end of the contract the property will be worth more or less than expected at the outset;
- **People Risks** stemming from factors such as culture, experience, motivation, attitude, interpersonal and teamwork skills;
- **Force Majeure** events over which the parties to the contract have little or no control, but which could have serious impact on their ability to fulfil the contractual terms. These include war, rebellion, nuclear explosion, earthquakes, and usually weather and geologically related natural disasters like earthquakes, floods, droughts fall into this category. Force Majeure risks are those that *a priori* are not expected to occur, consequently with an unknown probability of occurrence and a maximum uncertainty.

Due to the long concessions period, temporal aspects of risk are particularly important. A PFI project typically lasts 20 to 30 years. The question that needs to be answered is: *Do we know what is going to happen in X years?* The impact and probability of occurrence of a particular risk type changes as the project goes through the several stages, and consequently the uncertainty can either diminish or increase depending upon which period is considered. As decisions are made throughout the project, the uncertainty associated with, for example, construction or design risk diminishes, but the uncertainty of other risks such as economic, financial and political increases. A practical example is that the impact of the risk of severe flooding diminishes as a building is structurally complete, but clearly the risk is present for the whole contract period. Similarly, the probability of a fatal accident may decrease in the later stages of construction, after scaffolding has been removed, but the probability may remain

constant through a civil engineering pipeline project. In either case, the impact of adverse events may remain unchanged.

Figure 5.1 shows the proposed WLCRUM model of PFI projects. The model recognizes that in the long-term projects the evolution of the uncertainty attached to each risk is the key factor to manage. If uncertainty is high it means that there are few mitigation measures in place (probably for some risks there are none possible). If uncertainty can be reduced, it means that the risks are better managed, hence a project with a higher probability of success.

The evolution of uncertainty is represented for the above-mentioned global risks. It shows when uncertainty starts, when it ends, and the trend in between. As this representation of the model is not quantified the trends are the important issue, the fact that one trend line is above the other doesn't necessarily mean that the uncertainty is higher.

The risks presented are inherent of the PFI project irrespective of the partner to which they are allocated. In the great majority of risks uncertainty increases along the time horizon. If you are thinking today about the possible outcomes in five years time you might have a reasonable expectation, but if the time horizon is 20 to 30 years, the possible outcomes are increasingly difficult to forecast - that is, uncertainty increases.

The next sections describe in more detail how uncertainty evolves for all the global risks considered.

5.3.1 Political and Regulatory Uncertainty

Figure 5.1 shows that Political and Regulatory uncertainty starts at the very beginning of the project and continues to increase throughout the life cycle. It seems reasonable to consider that uncertainty starts at the beginning of the bidding stage, although formally it should start at the establishment of business need since there is always the possibility of a project's rejection.

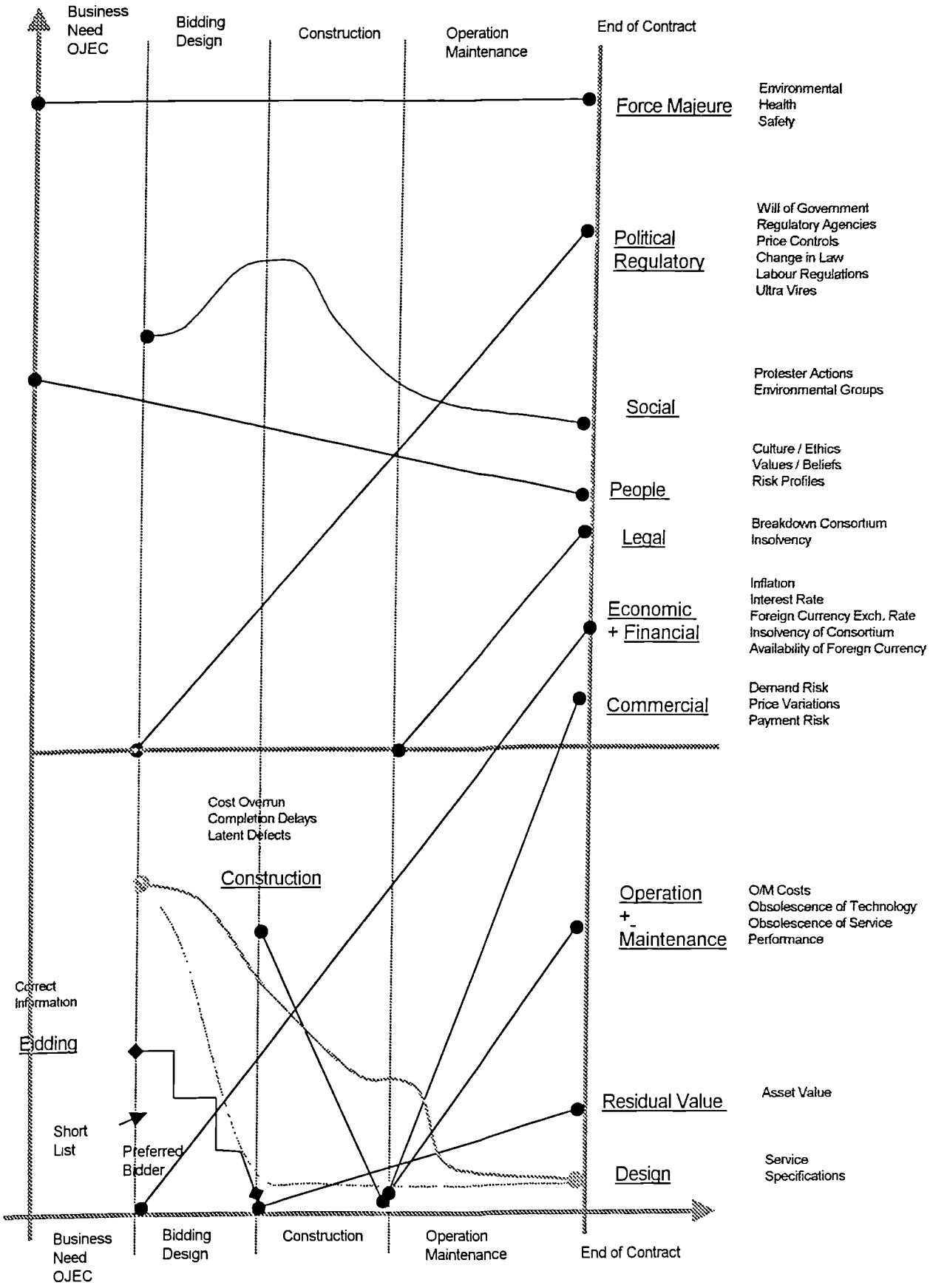


Figure 5.1. Model of Whole Life Cycle Risk Uncertainty

The directives of the Government and the Regulatory Framework 20 to 30 years from now are difficult, if not impossible, to predict, hence the increase in uncertainty.

Political and regulatory risks are often overlooked but are of the utmost importance in the long term. Political risks in this study are considered to be those defined by the HM Treasury Taskforce (1999) as Policy Risks, the risk of changes of policy direction not involving legislation. Regulatory risks can also be called legislative risks, i.e. the risk that changes in legislation may increase costs. This can be subdivided into general risks, such as changes in corporate tax rates, and specific risks that may discriminate against PFI projects. *Ultra-Vires*, the risk that a government body will act outside its jurisdiction, was a common setback in the early years of PFI before legislation was passed to clarify the position of NHS Trusts and Local Authorities. The legal and regulatory framework must be thorough, trustworthy, quick and transparent.

The government is responsible for the social, political and economic context and the regulatory framework. These are interdependent. For example, price controls can be dictated by the political and social climate. Risk management tends to overlook political risk, assuming an attitude of wishful thinking, and that the political environment will remain stable throughout the whole life cycle of the project. However, the assumption of political stability is fundamentally erroneous. Political instability is a major source of unforeseen risks.

The history of Political and regulatory risks is not well known. Rarely do managers know the shaky history of private investments, even when their own firms were involved in the disputes (Wells 1999). The first major shock to the stability of the international regime of private foreign investment was the nationalisation of foreign and domestic investment during the Russian Socialist Revolution in 1917 (Bubnova 1999). Other nationalisations took place decades later during the revolutions in China, Eastern Europe and Egypt. Classified as "strategic" all natural resource exploration infrastructures were expropriated in Mexico (1938), Iran (1951) and Bolivia (1952). In 1971, assets of the British Petroleum Exploration Company in Libya were expropriated. Even in Europe, expropriations took place in the late 20th century. In 1975, the Portuguese government, after the Carnations Revolution nationalised all private companies in the finance and industrial sectors that were classified as strategic. In 1989, the Tiananmen Square government crackdown in China changed what had been considered a safe environment for foreign investment, bringing about US$ 10 billion in uninsured losses. Political risk

insurance coverage of foreign direct investment is traditionally small. During the 1990s, the share of foreign direct investment covered by Berne Union investment insurer dropped 7%, from 14.9% in 1990 to 7.9% in 1998, reflecting relative comfort with political risks.

In recent years, in the Southeast Asia region (Tam 1999) there has been a growing trend for governments to undertake infrastructure projects under the BOT model. Very often it has been a painful experience for the private sponsors. One of the main conclusions drawn was that it was key that the host government would 'guarantee a proper business environment, such as no competing projects.'

Conflicts can also arise in the long term from the emergence of a new government. For example, the election of an opposition government in India led to renegotiation of contract terms for the Euron Dabhol power facility. Other sources of conflict derive from conflicting strategies of Governments that have the regulatory power and the companies that operate in the sector. One of the earliest conflicts occurred in Argentina. In the 1870s, the British-owned Argentine railways and the government didn't agree over expansion plans. Therefore, the Government built its own rail lines. Similarly, conflicts between different investment plans led to the nationalisation of Indosat, an ITT-owned communications company in Indonesia.

The country debt crisis in the 1980s and economic and financial crisis in Asia, Latin America and Eastern Europe in the late 1990s (West 1999) also have reminded investors that political/economic events do not merely have the potential to cause losses, but actually do cause losses. Consequently, investors are now paying much more attention to political risk assessment and management.

5.3.2 Economic and Financial Uncertainty

Economic and financial uncertainty starts with the bidding process as can be seen in Figure 5.1. The representation of financial risks includes the bidding risks that run until the contract is established and construction starts. Bidding risk usually is the sole responsibility of the contractors. Bidding costs are viewed as the starting point for the developer's total investment. Bidding very often involves significant investment;

especially design costs, consultancy and legal fees. Only after the signing of the contract do the senior lenders finance the project and share in the exposure. Bidding risks are highly dependent on the quality of information provided and decrease step by step as the several stages of the bidding progress. Financial Uncertainty increases with time. It is difficult if not impossible to accurately predict inflation, interest rates and foreign exchange rates. The same applies to the payment mechanisms.

Economic risk arising from the changes in the economic and policy environment is especially important in an international context (IFC 1999). Currency, foreign exchange, and interest rate risks fall in this category. Currency risks arise whenever foreign-currency-denominated funds, in the form of equity or debt, are used to finance the project. Such risks are associated in part with foreign exchange convertibility and foreign exchange rate. Macroeconomic stability, the balance of payments situation, and the foreign-exchange-rate policy in the project country are important factors to consider in assessing currency risks. Foreign-exchange-availability risk can be a problem when the project generates revenues only in local currency. Foreign exchange may not be available when it is needed to import materials, repay project debt or repatriate the profits and dividends of foreign shareholders. Interest rate risk applies to international project financing where long-term loans have floating interest rates. The international interest rate environment can change during the maturity period that is typically as long as 25 years. PFI is a national policy and some of these risks don't apply, but increasingly UK companies are partners in PFI type projects abroad, so they must be aware of the risks, and implement mitigation actions. For PFI, one of the most important economic risks is the Inflation risk, the risk that actual inflation will differ from assumed inflation rates.

Several types of funds are used for the financing of a given project. There is always a balance between short-term and long-term funds. Usually when a project begins its operational phase, some risks such as construction risks are eliminated and the flow of income starts to cover the debt, gradually reducing the exposure of lenders. It is not unusual for a project to refinance, or restructure the debt, looking for better financing conditions. This re-structuring is necessarily conditioned to the availability of funds in capital markets.

Similarly to political risks, and as the recent financial crisis in Asia demonstrated, economic and political risks are always prevalent. In 1997, within a period of only three weeks, the Thai baht slipped by more than 20 percent against the US dollar, and then dropped even further (IFC 1999). Because of Thailand's previously strong economic position, power

purchase agreements of international power projects in Thailand typically had not considered exchange rates in their purchase price calculation. As a consequence, to limit the losses, those power purchase agreements had to be renegotiated.

Edwards (1998) undertakes a literature review of risk and risk management in construction and finds surprisingly few references to economic and financial risks in construction. It suggests the need for bidding models that can reflect the economic climate. Financial risk literature is also a rarity, which is surprising considering its importance in project feasibility. Edward's analysis concluded that a prudent pre-construction risk evaluation could reveal a project's vulnerability to a property slump that endangers its financial viability. In addition, Edwards noted that the bankruptcy of American companies was most frequently attributable to economic and financial factors such as inflation, debt interest rates and inadequate capital.

5.3.3 Social Uncertainty

Uncertainty attached to the social risk begins to increase as soon the project is publicly visible (Figure 5.1). It reaches its maximum at the beginning of the construction stage when public awareness of the project is at its highest level, and consequently, the project is more prone to public scrutiny. As construction progress uncertainty continues to diminish until the end of the contract period.

The consequences of social risk are usually not as extreme as political risks, like expropriations, but still can be damaging. Infrastructure projects, by their size and impact on the economy (Wells 1999) are particularly sensitive to "social visibility" especially if they deal directly with the public. Price and other issues like safety can have a major social and political impact. For example, in the UK the Paddington disaster on October 5, 1999, where 31 people lost their lives and a further 400 people were injured when two trains crashed head-on near London's Paddington Station, triggered the revival of discussions about the privatisation and the use of PPP/PFI schemes in the transport sector. It was argued that due to pressures for profitability, investments in safety devices were cancelled, resulting in increased danger for the public as it was demonstrated that these devices could have prevented several disasters involving the loss of lives that had occurred since 1995. Consequently, the responsibility for safety in public transport was taken back to the government.

Infrastructure projects are especially susceptible to the increasing environmental consciousness in society, very often translated in Protestor's Actions. For example, the 'Eco-Warriors' in the UK build tree houses and dig tunnels closed by brick and steel doors. When an action takes place, they live on the trees and tunnels until they are forcibly removed. It took three to four weeks to remove them from the Manchester Airport in August 1999, when they were protesting against the construction of the second runway, which entailed felling some trees and reducing the height of others.

Also banks are increasingly aware of the ill effects of non-compliance with environmental standards, so they insist on the assessment of environmental due-diligence as part of their funding decisions. For example, the World Bank has its own sets of environmental guidelines that are internationally accepted as a benchmark. The IFC goes a step further and includes the assessment of due diligence of social issues like child labour, resettlement of indigenous peoples, etc.

5.3.4 Legal Uncertainty

The insolvency and breakdown of a project consortium may look remote in the near future, but it is a possibility that cannot be underestimated with project lives as long as 30 years. As such, Legal Uncertainty (Figure 5.1) starts when operation begins and goes on increasing.

There are several legal risks such as Breakdown and Insolvency of the project consortium that originate in the private sector. The contract must include measures to prevent, or at least control, the breakdown of the consortium. If differences can be resolved by a series of practical steps leading to a sound and practical conclusion, then such mechanism should be the preferred solution (Cordova 1994). The usual way to mitigate these risks is to include ADR measures in an attempt to reach commercial settlement instead of complex and costly litigation and arbitration procedures.

For example, the Government changes a Law that affects a sector as a whole, not an individual company, for example legislation for the disabled in the UK was not in place 10 years ago.

5.3.5 Bidding Uncertainty

Bidding Risks are those inherent to the negotiation procedures like unsuccessful bid or poor quality of information. The uncertainty deceases in steps according to the progress across the several stages of the bidding process. After short-list, preferred bidder, etc. the uncertainty decreases sharply until it ends at contract signing. There are situations however when bidding uncertainty is prolonged afterwards due to unresolved (or unclear) issues in the contract.

5.3.6 Construction Uncertainty

Construction risks comprise risks of cost overruns if construction is not completed in time, to budget and to specification. If costs significantly exceed the initial financing plan, they will affect the project's financial rate of return, and if the project cannot be refinanced, it may even be abandoned.

During construction and start-up uncertainty is high and large volumes of finance are required, typically a mixture of equity, senior debt and guarantees (IFC 1999). As can be seen in Figure 5.1 as construction progress, all uncertainties attached to cost overrun, completion, and delays continue to decrease. Finally, with project completion construction risks ends.

According to Smith (1999) the Risk Drivers for the construction sector are Financial, Legal, Political, Social, Environmental, Communication, Geographical, Geotechnical, Construction, Technological and Demand/Product. In the current research, the majority of these risk drivers are included in categories other than Construction but Geographical, Geotechnical were considered included within the Construction Risks.

5.3.7 Design Uncertainty

Design Risk is the risk that the design will not deliver services with the required performance or quality standards, and consequently the project will not meet its service-output specifications. It involves detailed technical assessment of the project and planning of the actions needed to put the project in practice.

Typically uncertainty is higher in the beginning of the bidding process (Figure 5.1). As negotiation progresses, service specifications are defined and uncertainty decreases sharply until the contract is signed. Nevertheless, in some projects, the decrease is not as steep and continues to diminish until well after construction finishes. In all projects after Service begins, uncertainty increases again, because it is when latent defects may become apparent. As time goes on, uncertainty diminishes. Due to possible liability from latent defects, uncertainty extends through the legal period of 12 years after the contract is signed.

The level and evolution of Design uncertainty is substantially dependent on two factors: experience and ambiguity prevailing within the sector. Empirical evidence shows that the effect of a company's learning process in successive PFI projects in the same sector, the so called *'learning curve'* is reflected in a line that declines more sharply with each project. A company/sector with a line that starts at a lower level and declines sharply by the time of contract signing can be considered in the mature evolutionary stage. The influence of the sector is also marked. Sectors like hospitals, with high ambiguity, tend to have a plateau starting from the bidding stage, declining slowly until the middle of construction stage, and declining more sharply until the end of the construction stage. This situation is illustrated in Figure 5.8 (sec. 5.4.7).

5.3.8 Commercial Uncertainty

Commercial risks are the subject of lengthy discussions because of their combined high level of uncertainty and criticality to the PFI's profitability. As a result, it is common practice to undertake three independent market studies before a contract is signed: one

by the Authority, a second by the project sponsor and a third by the senior lenders. It is a clear indicator on how the participants in the negotiations are trying to cope with uncertainty. Also, it is clear that, as time progresses, the uncertainty attached to both technical and service obsolescence continues to increase (see Figure 5.1).

Commercial risks are both critical to project revenues and complex to analyse because in reality they represent a combination of several other risks (HM Treasury Taskforce 1999) such as the following:

- *Operational Risk* - The risk that operating costs vary from budget, that performance standards slips or that the service will not be provided;
- *Maintenance Risk* - The risk that the costs of keeping the assets in good condition will vary from budget;
- *Technology Risk* - The risk that changes in technology will result in services being provided using non-optimal technology;
- *Volume Risk* - The risk that actual usage of the service will vary from the level forecasted;
- *Demand Risk* - The risk that demand for the service does not match the levels planned, projected or assumed. As the demand for a service may be at least partially controllable by the government, the risk to the public sector may be less than that perceived by the private sector;
- *Third Party Revenues* - The risk that revenues generated from third party demand for the property will be greater or less than predicted or expected. This risk has two key variables: price and quantity. This risk is evident when a third party to the contract pays for the service in a free-standing project;
- *Penalties for Under Performance and Non Availability Risk* - The risk that deductions relating to payment will be greater or less than expected;
- *Potential Changes in Relevant Costs Risk* - The risk that expenditure on relevant costs will be greater or less than was expected specifically because of changes in price. Who bears the risk will depend upon whether or not the price variations can be passed onto the purchaser. If the unitary payment is fixed or varies in relation to a general inflation index, the risk is borne by the operator. If the

unitary payment varies with specific indexes to reflect actual costs of the operator, then the pricing risk is borne by the purchaser;

- *Payment risk* – The risk that the buyers of the service will not pay.

The discussion that follows shows how these risks interrelate, and how they can affect a PFI project's profitability. The key underlying concept is **Margin** defined as '*Revenues* [5] *less the Costs* [6] *of the project'*. In relation to margin the statement that all participants in a PFI must be aware is:

The profit of a PFI is determined from the margin that the contractor can get from the supply of the service.

Figure 5.2 illustrates the relationship among the variables included in the Margin.

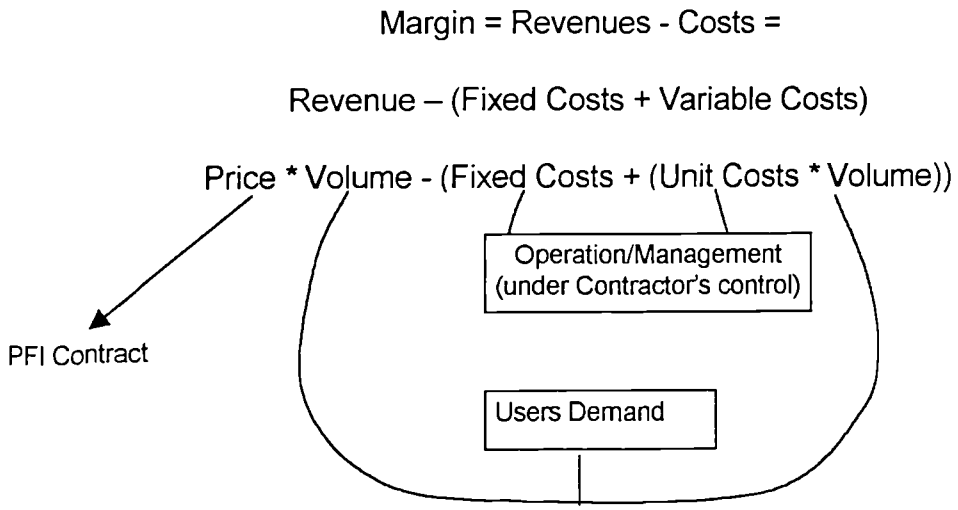


Figure 5.2. The Relationships within Commercial Uncertainty

The contractor, in order to maximise its profits, has to:

- Maximise Revenue to have more income;
- Minimise Costs to decrease expenses.

5 Revenues are calculated multiplying Market Volume (measured in units) by Unit Price.
6 Costs are subdivided in Fixed Costs and Variable Costs (costs incurred by unit produced or serviced).

Profit (positive margin) for the contractor is dependent on several factors over which it has little control during the operational phase of the project. The price is dependent on the previously established PFI contract. An incorrect estimate can have damaging consequences. The volume (or level of usage) depends on the market and has both a positive and a negative influence, respectively increasing revenues, increasing variable costs. Also, if the service is not used up to the levels that were forecasted, the revenues are less than expected with serious consequences for the profitability of the project. Again, there is little possibility that either the Government or the Contractor can control the usage level like in the Royal Armories[7]. There are special cases where the service level is pre-set (prisons and accommodation where the volume is determined by availability not occupancy), but with a free-standing PFI project in a market-driven situation such as toll roads, the volume is dependent on the users.

The next section describes in more detail the factors also included in the margin but related to Operation and Maintenance.

5.3.9 Operation and Maintenance Uncertainty

As can be seen in Figure 5.1 O/M uncertainty starts with Service commencement and goes on increasing as times progress until the end of the PFI.

Strict O/M cost control is critical to project revenues. Effectively, it is the only factor included in the margin that the contractor can effectively manage once the service provision has commenced.

Costs are the only items for which the Contractor is directly responsible, and their control is a critical factor for the revenue of the project. It is important to note that not even the contractor has complete control over costs, because other variables such as inflation and prices of supplies also affect costs. In *lato sensu,* within costs are also included financial costs, but this discussion focussed only on operational costs as for financial costs there are adequate mitigations measures, such as renegotiation of debt and

7 The Royal Armouries (a free-standing PFI project) has in, July 1999, revised the ongoing PFI contract for the management of the Armouries. The attendance of public was half of what was expected, and there were simply not enough revenues to make the project viable, so management went back to a trust, and the previous concessionaire now only runs catering and other services.

other instruments specific to financial management that are dealt with in financial uncertainty.

Included in Operational and Maintenance Risks are Performance and Obsolescence Risks. Performance risk is related to possible deviations in the level of service from specifications that were predetermined in the PFI contract. Obsolescence Risk has two components: the risk that the service will no longer be needed, and the risk that the technology in place will become outdated.

In projects where the government is not the client, another type of commercial risk that gains relevancy is Payment Risk. When the buyer is not creditworthy, project sponsors often seek government guarantees.

5.3.10 People Uncertainty

The influence of human factors in risk management is widely acknowledged. Yeo and Tiong (2000) consider that the *'human factors'* have strong influence in entrepreneurship and in a consortium where they can be decisive in risk reduction and in the overall risk management process.

At the beginning of a PFI project, uncertainty is higher due to the poor level of confidence among parties (Figure 5.1). The establishment of good interpersonal relations will only be built up during the development of the project thus reducing uncertainty. There is also a learning process and shared experiences, which gradually causes uncertainty to diminish. A good example of people's uncertainties is the difficult negotiations between Unions and the UK National Health Service. John Hutton, the UK Health Minister has recently announced (Financial Times 2002) that ancillary staff will remain in NHS in all new PFI hospital deals, which triggered some attacks from private companies that interpreted this move as "a political fix to buy off trade union opposition".

In the PFI environment, the most relevant people uncertainties deal with risk perceptions, risk attitudes, decision choice, and the ways in which interpersonal communication affects the flow of information and the project management process. Decision-making

biases and risk-learning process are also important related issues. The behaviourist aspects related to the uncertainty of project outcome and the sheer amount of financial risk involved makes people uncertainty a very important area in PFI. A brief comment on the most relevant issues mentioned above follows. These are: Risk Perceptions, Risk Attitudes, Decision Choice and Interpersonal Communication.

5.3.10.1 Risk Perceptions

An analysis by Akintoye (1998) of the risk perceptions of government, contractors and financial institutions involved in PFI projects shows clearly that each group ranks most highly those risk factors that are closely related to their own business objectives. Contractors focused on risks that threaten their profit level, the most important is design risk, closely followed by construction cost overrun risk. Governments look first to risks that threaten the timing, availability, and performance of the asset, with commissioning risk ranked highest followed by performance risk. Lenders look to threats to the recovery of capital and interests, payment risk being the most important, followed by volume risk. The three parties have adopted different methods and techniques in dealing with risk assessment of PFI schemes. They also approach risks in different ways, and it is therefore not surprising that this results in different and conflicting outcomes. There are similar findings (Edwards 1998) concerning clients, contractors and consultants. Their risk perceptions were quite different.

The fact that parties have different risk perceptions is not necessarily bad; on the contrary, it might be welcomed. Different perspectives, if well managed, can lead to better decisions, less biased and more thoroughly checked processes. For example, in some IT PFI projects that have had problems, the contractor has provided its own financing. It has been suggested that one of the reasons for these problems is that the lack of a financial partner has prevented a more careful and thorough project feasibility study. The key is to manage the different perspectives efficiently and effectively so that the conflict is not disruptive, but on the contrary can lead to better decisions.

Risk perceptions are closely related to tolerance for ambiguity (Ghosh 1997). If the government or the project is ambiguous, they will trigger resistance from employees,

who perceive their jobs to be threatened. In PFI, the Public sector has several options regarding staffing (Morgan 1999):

- No Staff transferred, as with all new prisons contracts;
- Some staff is transferred, as in hospitals and schools (clinical/teaching staff remain in the public sector);
- All staff transferred as with major IT projects.

Special attention has to be given to adequate training and reassurance to people that are transferred to the private sector regarding issues such as conditions of employment, transfer of pensions and acquired rights.

5.3.10.2 Risk Attitudes

The people attitudes towards risk (Boothroyd 1996) can be illustrated by the Utility Theory graph shown in Figure 5.3.

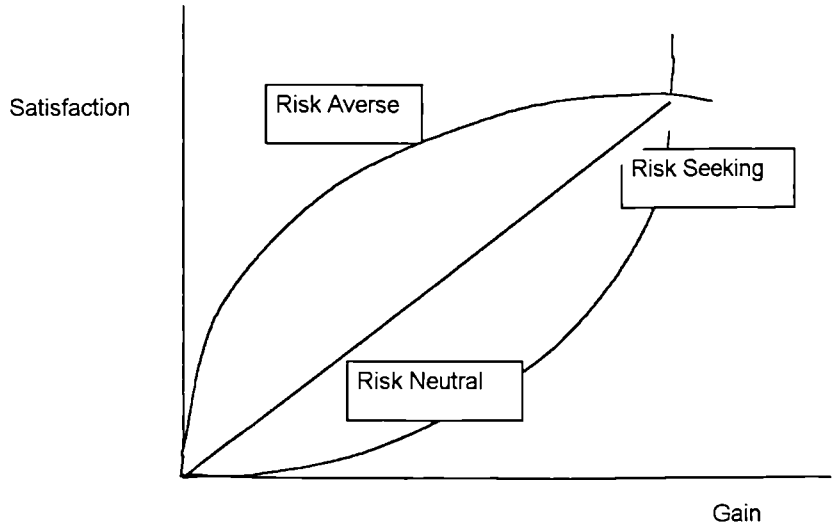


Figure 5.3. Utility Theory

Utility theory simply measures the satisfaction a person will receive from particular levels of gain and what that person is willing to gamble in order to achieve that gain. People's attitudes towards risk fall into three categories: risk neutral, risk averse, and risk seeking. Prior experience and knowledge can also influence risks attitudes.

How managers react to a decision environment (Coopers 1988) depends on how they interpret signals from that environment. Decision situations can be categorised as either opportunities or threats. Managers consistently tend to see more opportunities in risky situations than do bureaucrats, and typically express strong confidence in their abilities to take advantage of opportunities. Therefore, in PFI projects, the public and private sector can be expected to have different risk attitudes. The public sector being more risk averse and the private is more prone to take risks. The need for people with different risk attitudes to work together is one of the critical human-relations aspects of the PFI.

The importance of the role of staff attitudes transferred from the public to the private sector is emphasized in the Treasury's recommendations.

> *'Success relies on dedication and commitment of staff .... it is necessary to encourage personal investment in the future of their organisation'* (Morgan 1999).

5.3.10.3 Decision Choice

The roles of risk attitude and tolerance for ambiguity for predicting choice were analysed by Ghosh & Kay (1997) and the results indicate that

- Both risk attitude and ambiguity intolerance determine choice behaviour;
- The role of individual attitudes depends on the levels of the two treatment variables of risk and ambiguity. In managerial terms, this means that ambiguous decisions contexts, with the presence of risks and ambiguity, can lead to dysfunctional behaviour and sub optimal decisions;
- The presence of ambiguity accentuates the perception of risk in individual subjects;

- Decision-makers who have greater tolerance for risk and ambiguity, display greater confidence in their choice. Krueger and Dickison (1994 in Gosh & Kay 1997) demonstrated that more confident and optimistic decision-makers take more risks and Gosh & Kay (1997) found that less risk-averse decision-makers display more confidence in their decision choice. Therefore, when managers are more confident and take more risks, their organisations will enjoy more innovations. Also, because risk-averse individuals display less confidence, the presence of ambiguity in managerial decision context, if interpreted as risk, reduces confidence and induces decisions that are even more conservative.

5.3.10.4 Interpersonal Communication

Project success (Edwards 1998) is highly correlated with project management approach in terms of team communication and understanding of project goals. Successful risk management was found to correlate with experience; the riskier the project is likely to be, the more experience is sought in the person appointed to manage it. The IFC (1999) found that, in its experience, one of main reasons for the failure of projects it finances is poor project management, others being construction problems and lower-than-expected projected demand. The right man for project leader seems to be of critical importance, at least in the bidding stage. Indeed, key-man loss is one of the items included in PFI insurance packages. Some authors, like Mobsby (1994) suggest that the project leader should be someone independent of the organisations involved. Only then it would be possible to have an unbiased and thoroughly considered decision.

According to Rocheleau (1999), one of the reasons of failure in public procurement has been the inability to share. Although the technical barriers can be overcome, many organisations may be reluctant to share because they have strong incentives to retain control over information, and information is power. Again interpersonal relationships play an important role, as they remain the main vehicles for exchange of information; for example, it is estimated that in an interview 65% of the information is transmitted via visual contacts (Padgett 1998).

Showing a great concern with the interpersonal issues in PFI the UK NAO published a report that stated

> *'The key question we have sought to answer is whether authorities manage their PFI relationships to secure a successful partnership.... PFI projects involve long-term relationships between authorities and contractors who, at first sight, appear to have different objectives. A successful outcome for both parties can only be achieved if they are prepared to approach projects in a spirit of partnership'* (NAO 2001).

5.3.11 Force Majeure

Force Majeure consists of events that cannot be forecasted and therefore its uncertainty can be considered constant throughout the life of a PFI project (Figure 5.1). It begins when the decision to undertake the project is made and ends when the project finishes.

5.3.12 Residual-Value Uncertainty

Residual-value uncertainty concerns the value of physical assets at the end of the contract. At the end of the PFI project, the asset can be returned to the Government if it is going to be re-tendered. In this case, compensation might be paid to the contractor. Alternatively, the asset can be handed to the contractor that will use or sell it. Residual-Value Risk is associated with the future value of assets, and similarly with other risks, uncertainty increases as the time period is extended. So whenever there is a value allocated to the future value of an asset, the related uncertainty increases with time (Figure 5.1).

5.3.13 Summary: the WLCRUM applicability

A PFI project is complex involving several types of risk throughout the different stages of its life cycle. This chapter proposed the WLCRUM model. It has a top down approach on risk and includes all the global risks grouped in categories, like financial, construction, operation and management, environmental, and social, etc. The model's main innovative feature is that it recognizes that each risk's uncertainty is not constant throughout the whole life cycle, thus recognising that uncertainty is dependent both on the type of risk and on the period of the project's life cycle. It is more informative than a risk matrix where the risks and their impact are assessed.

The WLCRUM model is an assessment and management tool for risk uncertainty. The model's fundamental assumption is that in the long-term projects the evolution of the uncertainty attached to each risk is the key factor to manage. If uncertainty is high it means that there are few mitigation measures in place (probably for some risks there are none possible). If uncertainty can be reduced, it means that the risks are better managed, hence a project with a higher probability of success.

The WLCRUM model can also provide a preliminary evaluation of the degree of maturity of the PFI by the analysis of evolution of the design uncertainty. It can also be used to structure the analysis of strategic decisions regarding PFI. It can be used as a Decision Support System for Senior Management to assess the risk in long-term projects as it allows a clear view on how uncertainty progresses, avoiding the wishful thinking attitude that underestimates some types of risk, thereby preventing the adoption of corrective measures. Project Managers can also use it as a project management tool as it forces them to rationalise the underlying reasons of uncertainty and provides an opportunity to implement measures to reduce it. Finally Researchers can use it as a basis to develop models (Fuzzy Logic seems a natural choice adequate to the type of data obtained) as for the quantification of the Long Term Risk Assessment in PFI (or other similar projects).

The remainder of the chapter presents the test examples drawn from the case studies on PFI to validate the WLCRUM model, and concludes with the application of the model to quantify uncertainty in two PFI projects: Lusoponte and Indáqua.

5.4 Testing the WLCRUM model

The following sections present the tests on the risk uncertainty model drawn for the case studies developed in the current research. For each type of risk were chosen the two most illustrative examples drawn from the case studies (for some PFI projects the graph of the uncertainty's evolution is included). The risks are described together with the consequences and adopted mitigation measures. It is important to note that often the same issue relates to more than one type of risk. An effort was made to analyse separately each risk type, but it is inevitable that in some instances more than one type of risk is apparent, nevertheless it was decided to maintain the description, as it is to make it possible to understand the issue.

The data was collected during the fieldwork undertaken for the PFI case studies. For the PFI projects of Lusoponte and Indáqua it was possible to collect semi-quantitative data for the evolution of uncertainty throughout the whole life cycle. As such, the chapter ends with an example of the quantification of each risk for the different projects. MATLAB was the software used to analyse the data and quantify uncertainty; it is a high-performance language for technical computing that permits data analysis, exploration, visualization, modelling, simulation, and prototyping.

5.4.1 Political and Regulatory Uncertainty

Lusoponte and Indáqua projects exemplify political uncertainty (Table 5.1). In both instances, political uncertainty is strongly affected by lack of consistency in government will and by governmental changes that affected the composition of the negotiation and project management public sector teams. Co-ordination problems within the various governmental bodies and agencies also adds up to uncertainty.

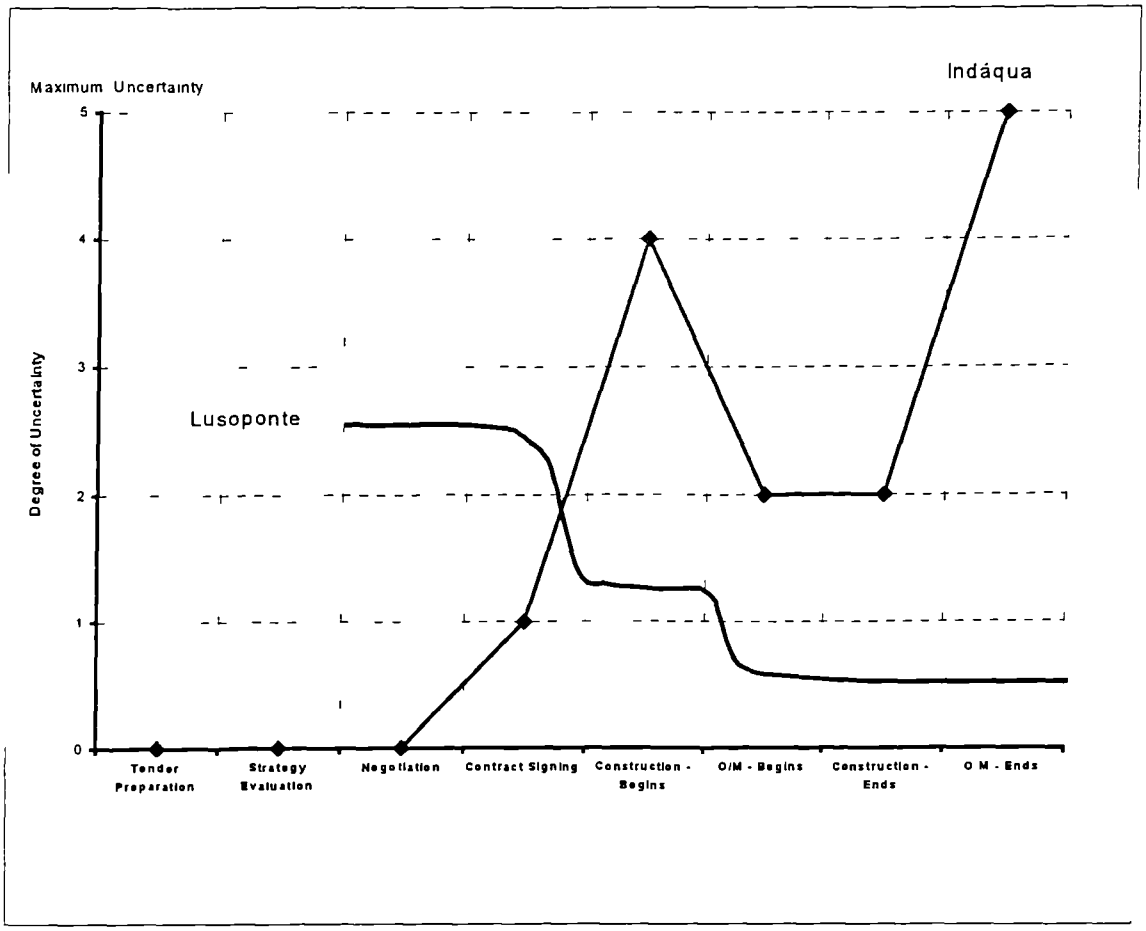


Figure 5.4. Political Uncertainty in Indáqua and Lusoponte.

Figure 5.4 illustrates how political uncertainty throughout the whole life cycle is perceived by Lusoponte and Indáqua' stakeholders. The different trends in the two projects reflect the particular conditions under which each project developed, especially during the bidding stage.

Table 5.1. Political Uncertainty

LUSOPONTE

Lack of consistency in governmental will - During the negotiations and after the contract' signing the Government's orientation changes. Such changes happened when a Socialist (PS) Government replaced the Social Democrats (PSD) Government. And also when a second PS government replaced the first PS government

The lack of consistency has become more apparent after Gabinete da Travessia do Tejo em Lisboa (GATTEL - The government's project management team) influence diminished because: first, it was scheduled for extinction at the end of 2000, and, second because of a lack of political backing from the second PS government. Lusoponte now has to deal with the Ministry of Public Works and the Ministry of Finance separately. This creates co-ordination problems, the two Ministries don't have a common orientation, and although Lusoponte tries to sit both at the same meetings it is very difficult to find a common governmental orientation. It is like having to deal with several partners instead of one.

Third Crossing - Lusoponte as per the settlement agreements signed in July 2000, is undertaking a pre-feasibility study for the Third Crossing (road-train) over the Tagus. So far, the Government is politically determined to have a crossing that connects the north and south rail network, and although a road crossing looks necessary to alleviate the 25th April crossing, it hasn t so far committed itself unequivocally to a road crossing. This Business Case consisting mainly of traffic studies and other preliminary technical studies, will be the basis for the Government's decision regarding this crossing.

The existing contract doesn't award Lusoponte the design and construction of the crossing, and the decision to make (or not) the crossing lies entirely with the Portuguese Government. Also, if the project is to have access to European funds it must be competitively tendered and there is an additional potential risk that Lusoponte will have to operate a crossing designed and built by another entity, whose concern will be solely construction and not maintenance.

INDÁQUA

Conflicting interests - The disarticulation among Ministries has lead to delays in the decisions and potentially reduced the bargaining power of the public sector in the negotiation. The negotiation teams are almost always replaced when the government change, each Ministry has its own policy guidelines and the Government often imposes politically driven decisions that affect the financial equilibrium of the project.

New Political directions after signing the concession contract led to non-availability of EU funding – Stª Maria da Feira Municipality opted to apply for EU funding to construct some infrastructures because it has a small budget and is legally prevented from having the service debt weight over 20% of its budget. The concession contract was signed in the belief that the Environment Ministry would make the necessary funds available. What happened was that: First, the Central Government took about a year and a half to send the application to Brussels for funding through the II QCA (Community Support Framework),. It arrived there four months before the end of the program and the fund was exhausted. Second, by the time the III QCA was available the Minister had been replaced and the policy for EU funding too, giving in practice sole access of EU funds to IEP-AdP (a state owned company).

According to the concession contract, any delays in construction or no (reduced) EU funding are considered to be the municipality' exclusive responsibility, as it is recognised that Indáqua Feira would incur revenue losses due to the non-availability of infrastructures that are part of the networks under construction and that are critical for the whole operation. Stª Maria da Feira Municipality partially solved the problem by establishing a second contract to build their share of water distribution system with SIMRIA - Sistema Multi-municipal de Recolha, Tratamento e Rejeição de Efluentes da Ria de Aveiro, a local Multi-municipal system participated by IEP-AdP and adjoining Municipalities.

However, Stª Maria da Feira has yet to solve the problem of funding to construct its share of the wastewater sewerage network the sewage interceptors and treatment. The share f the network that is the private partner' responsibility is also on hold, as under the agreement established between Indaqua Feira and European Investment Bank (EIB), the concessionaire will not start any investments in the sewerage network until this issue is definitely solved.

State Monopoly - In Portugal, the majority of Local Authorities are small, and depend on the availability of EU structural funds to undertake the much needed infrastructure investments. But, now the Central Government controls the III QCA funds, and only accepts the proposals (against EU directives) from Multi-municipal systems in which IEP-AdP is a majority shareholder. Nor can the private companies or even the Local Authorities apply, as was the case when the Indaqua Feira concession contract was negotiated and signed.

Consequently, the private companies, like Indaqua, that have entered the water supply and sewerage management market with an expectation for a large market are now faced with legislation that, in practice, gives the monopoly of all the systems upstream from the clean water distribution networks or downstream from the wastewater collection networks to IEP-AdP a state owned company. IEP-AdP has the exclusive rights to apply for the EU funding (non returnable) and the Local Authorities, that have the exclusive competence to manage these services, don't have the necessary funds to undertake the construction works. This leaves for the private sector only the market for infrastructure of the clean water distribution and the wastewater collection networks, because with the level of investment needed it would be impossible to have an adequate return and simultaneously maintain a reasonable level of tariffs if only private funding would be used.

As an example of the prevailing political will, on 25th May 2001 the concession of the Municipal System of Wastewater Treatment of Algarve (southern Portugal) was awarded directly without any tender to the company Águas do Algarve, owned 51% by IEP-AdP and several municipalities of Algarve that were forced to join against their will.

In Lusoponte it is almost consensual that political uncertainty increases steadily as the projects proceeds, reflecting the common perception that further down the time horizon what will occur it is not known. However, from the commercial side there is a different opinion: They consider that in a project of this nature – running a public infrastructure with low operating risk and a guaranteed market - the political risk diminishes once it is perceived that the project is operating well. Consequently political uncertainty should decrease by steps coinciding with the stages of the life cycle. This opinion clearly reflects the commercial side of the project, but undoubtedly there are factors that increase uncertainty in time, like the hypothesis of a privatisation. This example illustrates how two totally different opinions co-exist in the same project, reflecting the different perceptions of the stakeholders. In a real life situation, different opinions would make it necessary to re-analyse the issues reuniting the stakeholders in order to reach a consensus.

With Indáqua political uncertainty has a maximum at the moment of the beginning of construction mainly due to the lack of clear goals of public sector and changes in central government directives. Clear objectives were defined after construction begins, hence the decline. Uncertainty rises again during the operation stage.

5.4.2 Economic and Financial Uncertainty

Lusoponte and Indáqua projects exemplify the economic and financial uncertainty (Table 5.2). In both projects the financial uncertainty associated with the heavy investments for the usual financing and insurance arrangements mitigate the construction start-up. As to the economic uncertainty the main concern is inflation, which is always taken into account in the financial models. These are risks always taken by the private sector up to a certain level, like the price correction mechanisms associated with inflation. It is the private sector task to look in the financial markets for financing and mitigation tools that can minimize uncertainty.

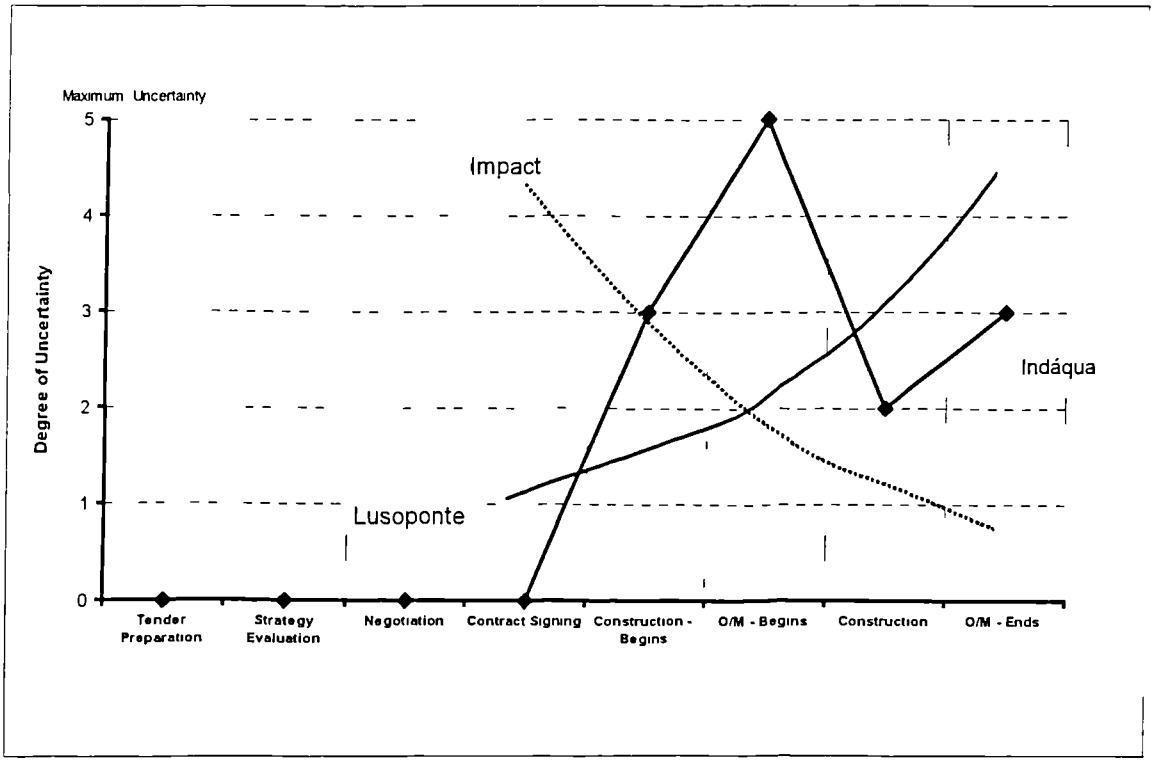


Figure 5.5. Economic and Financial Uncertainty

Figure 5.5 illustrates how economic and financial uncertainty throughout the whole life cycle is perceived by Lusoponte and Indáqua' stakeholders. For Lusoponte the economic uncertainty begins with contract signing and increases with time. The uncertainty of the some important variables, is already taken into account in the financial model. For example the unit price for the service is indexed to inflation and the impact will be reduced.

As for other financial uncertainties like Interest and Foreign Currency Exchange Rates - a risk taken by the private sector – the uncertainty also increases with time. Very importantly their impact will be much higher at the beginning of the project than in the end. (see Figure 5.5 for the dotted line that represents the potential impact in the project). At the beginning leverage (debt) is much higher so the impact is higher. Nevertheless these risks are usually partially mitigated recurring to some of the existing financing mitigation tools.

Table 5.2. Economic and Financial Uncertainty

LUSOPONTE

Interest Rates The contract had fixed interest rates and when the tender was launched, in 1993, the interest rates varied between 7-8%. In March 1995 they had climbed to 11-12%. Consequently, the Internal Rate of Return decreased from 11.43% to 10%. This risk was completely absorbed by the private sector without mitigation measures even insurance. The Portuguese financial market was not developed enough to permit the contracting of a 'cap', i.e., to insure the risk of excessive increases in the interest rates. As a result the risk was reflected in the project adding an extra 8 billion escudos to the overall project cost.

Contract not yet shielded reduces financing options - The 20-year EIB financing was needed because at the time of the contract signing there was no other entity that would lend over this period, as an example public debt was not issuing bonds at such long-term the maximum was 10 years. The other option for long-term financing - capital markets - was considered inadequate for this project. A monoline finances long-term, but with thousands of investors in the stock markets, it needs a very stable project. It is completely impossible to refinance, and there are very strict controls of the financial ratios variability. The EIB financing was a strategic decision taken by the shareholders. In the last refinance negotiations EIB and an US monoline were competing for the financing with very similar conditions. The shareholders knowing that the project was not contractually shielded, and that it would not reach financial stability for a prolonged period (the construction of a third crossing is an open possibility), opted for EIB financing because it was more flexible than a monoline financing.

As to the additional financing needed for the third crossing in the event that design and construction is awarded to Lusoponte, one of the two options is possible:

- It will be included with the existing financing, involving a global financial restructuring of the project.

INDÁQUA FEIRA

Inflation - Both Indáqua Feira and the Municipality carry financial risks, because both have construction works to undertake, and need external funding. Inflation is a major risk that the project carries especially because the works are going to extend for eight years.

Payments by the Municipality - The concession can involve several types of payments to the concessionaire from the Municipality. These can be either the predictable annual subsidies to the concessionaire or unexpected payments like when the financial equilibrium of the concession has to be re-established by the Local Authority. Two issues negatively affect the realistic possibility of getting the payments:

- The Local Authorities have small budgets and the service debt weight on the annual budget is nearly always very close to the limits, so they cannot recur to further borrowing. Any financial compensation will be hard to get;
- The other way to get a financial compensation is increasing the tariffs, which is both unpopular and politically damaging to the local politician.

Indáqua – In this project, the construction is phased, the operation of part of the network starts before the construction stage ends. As such, economic uncertainty increases up to the start up of service commencement afterwards it decreases as construction gets to be completed and less funds are needed. After the end of the construction stage uncertainty increases again, but it is the natural increase associated with the project' long term nature, and also the hypothetical need for financial compensations to the concessionaire by the Municipality.

5.4.3 Social Uncertainty

Apart from the risks associated with environmental concerns, there are risks related to the project' social impact. Typically the social uncertainty reaches a maximum during the first stages of construction when the project becomes visible and decreases afterwards after dealing with the issues raised.

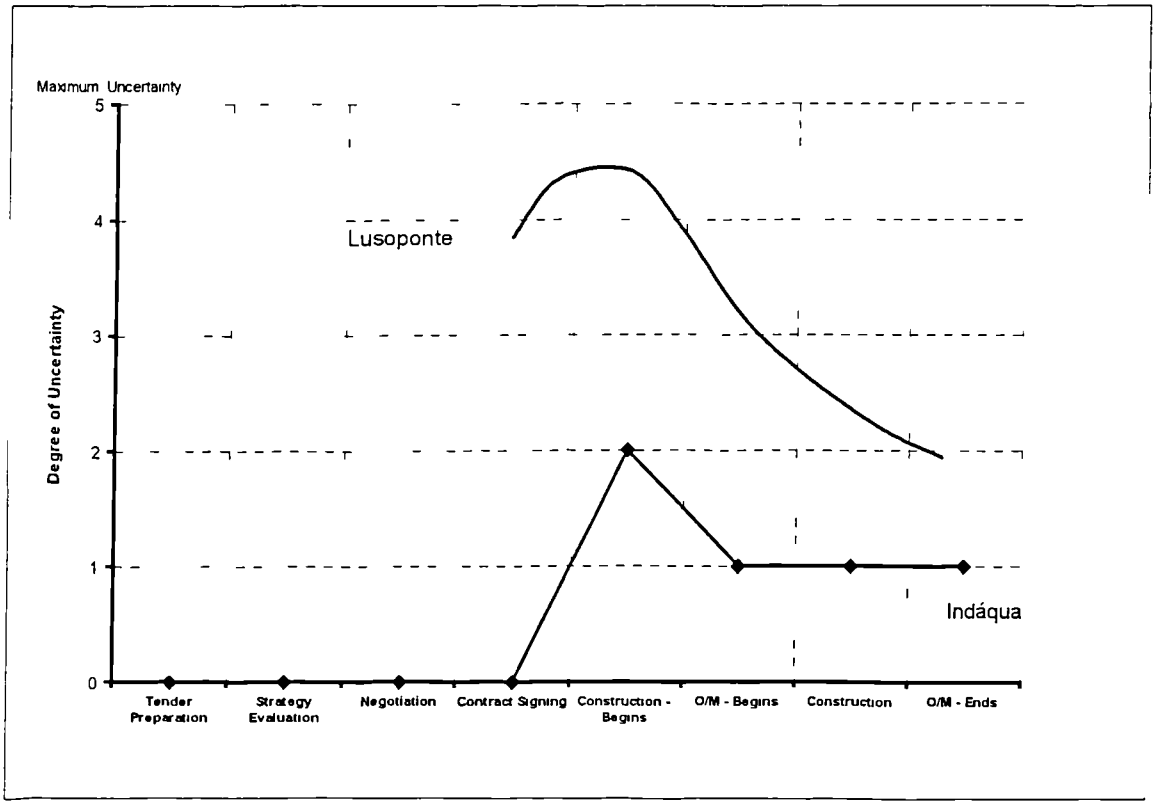


Figure 5.6. Social Uncertainty

The examples of Indáqua and Lusoponte illustrate this view (Figure 5.6). The uncertainty trends in both projects are very similar, with only the difference that the level of uncertainty in Lusoponte is much higher. This reflects both the project's social visibility and all the problems that arose. A good example is the extensive litigation between Lusoponte and GATTEL and particularly with the indemnity that was awarded to Lusoponte regarding the claims for the loss of revenues with the 25th April Crossing imposed unilaterally by the government. The image transmitted to the public by the media (and some political parties) was that the project was costing a lot of taxpayer's money. This negative image was even extrapolated to project finance, creating the assumption that this type of financing was expensive and likely to need a lot of

taxpayers' money and consequently pawning future generations' income

In Table 5.3 are described examples of social uncertainty in three PFI: Lusoponte, Indáqua and JSCSC. It illustrates how Social Uncertainty never drops completely and it is not uncommon that social issues can be present for the duration of the project's life cycle as it happens with the JSCSC with a potential claim from the Human's Rights Act (HRA).

Table 5.3. Social Uncertainty

LUSOPONTE

Expropriations - Lusoponte took the risk of expropriating all the land necessary for temporary and permanent works, including the risk of land price inflation. This was the first time that this process, normally undertaken by government agencies, had been carried out by a private sector company. The Government's sole role was to declare the designated areas for "public benefit". This administrative process was well conducted. At the beginning, there were 350 parcels to expropriate, out of these 250 settled amicably and 100 had a Court settlement (20 are still pending). Some tried to speculate by asking for unreasonable values. For example, an industrialist asked for 1.8 billion escudos, and finally the court for 280 million escudos settled it.

On the north shore, there were two areas: the EXPO98 site a disused industrial area and to the northern end, property was predominantly commercial and residential where 273 families were re-housed in new apartments constructed by Lusoponte or received financial compensation. A new primary school is being built at Portela to replace one demolished on the boundary of the Praça Jose Queiros access and an old age day care centre in Moscavide has been relocated. On the south shore land was predominantly agricultural.

Buzinao (Big Hoot) According to contractual terms, the tolls for each crossing where to be equalised. As a consequence of this the Portuguese State raised the tolls on the 25th April Crossing in June 1994. This caused a public outcry (buzinão) and the government was forced to rescind this decision. The toll will remain frozen at 150 escudos (for class 1 vehicles) until 2002, when it will be raised to 200 escudos (1 Euro). A rise of 1.5 times the Base Toll instead of 2.6 times. In addition, the Portuguese State imposed on Lusoponte a Frequent User Discount Scheme in August 1994 for users of the 25th April Bridge only. A 10 percent discount for users pre-purchasing books of twenty tickets with no date limit, and a 20 per cent discount for users pre-purchasing books with a one month limit was introduced. A further scheme was introduced for the Via Verde, allowing a 50 per cent discount after the 13th trip within a month, and with all trips after the 72nd being free.

As a result the Portuguese Government had to agree on six compensation packages required to restore Lusoponte's financial position in relation to the GATTEL Base Case.

INDÁQUA

Public Perception - This project doesn't involve a great deal of controversy since the need for the establishment of the water distribution and sewage networks is well understood and accepted. Nevertheless it is always necessary to mitigate some opposition especially related with the inconveniences during the construction stage. For example, it is necessary to maintain good relations with the church (it is a strongly catholic region) and make provisions to prevent that construction works, like open ditches, disrupting the passage of processions.

Mixing Local Authorities - The solution to integrate St^a Maria da Feira network with the networks of adjoining municipalities carries the risk of opposition based on ancient rivalries. The projects involving water supply are especially sensitive to these issues and procedures to deal with them have to be established.

Rights of Way - During construction it is also necessary to take care that the rights of way are accounted for. Local people are very sensitive to these rights.

JSCSC

Humans Rights Act (HRA-1998) - and its application commencement in October 2000 gives local citizens a statutory right of appeal against infringents of personal rights/freedom. There is a strong body of legal opinion that Government bodies (and by implication their agents such as Defence Management - DM) cannot interfere with their rights by claims to Crown Immunity, as was previously done. Social risks; for example the temporary shortage of school places; could lead to action against the MoD and their agents, DM, etc. There are currently no legal directions as to the liability for actions under HRA (1998). Therefore DM has an unknown potential liability.

Environmental uncertainty is considered included in the social uncertainty. It is related mainly with: The activity of environmental pressure groups (e.g. Lusoponte) and that derived from Force Majeure events - natural causes (e.g. JSCSC) for which there are few (or none) mitigation measures (see Table 5.4). The environmental awareness is growing in our society and when a project is launched (especially if it has a great social visibility and/or potential social impact) it is inevitable that it will be closely scrutinised (e.g. Lusoponte). By complying with good environmental practices, always undertaking environmental impact assessments, the sponsors can in great extent reduce the uncertainty.

Table 5.4. Environmental Uncertainty

LUSOPONTE	JSCSC
The environmental groups were very active during the bidding and construction. As a result of their pressure there were several adverse and non-foreseen consequences for the winning consortia: • The European Commission conditioned the availability of funds subject to the existence of an approved Environmental Impact Assessment (EIA) that was influenced by the Commissioner Wulf-Mathies. • Suspension of EU funds, due to alleged violations of the EIA until the signing of a protocol between the EU and the Portuguese State establishing conditions that had to be satisfied for a further release of funds. • Increased expropriation of an area of 300 ha, to include the Samouco Salt Pans special protection area. The viaduct would typically have required a much smaller area. This resulted in a claim (now settled) of 1.2 billion escudos for expropriation and refurbishment of the saltpans area. • The building of a viaduct instead of an embankment to cross the saltpans. Initially the crossing of saltpans was to be made by embankment, but to avoid a detrimental effect upon the area a 4.5 Km viaduct was built which meant an increase of 25 billion escudos in costs. • The Lusoponte's staff also includes an Environmental Engineer, which was not anticipated at the beginning of the project. The environmental impact of the bridge was controlled and minimized by: • Measures to minimize noise levels and air pollution including landscaped acoustic barriers; • The leaching of metals from the bridge is controlled. On the South Viaduct, where it crosses the saltpans, the rainwater runoff, contaminated by metals, oils and other pollutants, is collected in three treatment tanks; • The construction not affecting the fish nursery areas in the estuary; • The disturbance of river sediment being a one-off situation, and was not significant since the estuary is very dynamic – every day 1 3 of the water volume is transferred to the sea by the tides- consequently, the tidal erosion in the riverbed is very high, rendering irrelevant the disturbance caused by the bridge • The greatest environmental impact of the crossing being the urban development on the South shore. How this development will proceed depends on the Local Authorities permissions for urban developments in an area that was mainly rural. The monitoring studies that Lusoponte regularly undertakes, includes an evaluation of the social and economic conditions surrounding the Vasco da Gama crossing.	**Flood Water** - The JSCSC was built to withstand an event that would occur 1:100 years (once every hundred years), i.e., exceptional one. Unfortunately the rains in the winter 2000 were a 1:200 event, which caused all sorts of problems namely: flooding in the ground floor of the main building and the lagoon's overflowing in spite of the drainage installed (it was supposed to overflow to a creek). **Contamination** – The 1:200 event caused mains sewerage from site (and also of-site) to overflow into the containment lagoon. This lagoon (also a landscape feature) was then required to be pumped dry, its previous stone lining removed, the whole cover decontaminated and then relined with a new stone lining and then refilled. All at no additional cost to the SPV client and at the expenses of John Laing Const.

5.4.4 Legal Uncertainty

Uncertainty starts at the beginning of bidding until the signing of the contract, increases sharply during construction with the increase in number of companies involved and the contracts that bind (thus increasing the possibility for claims). After service commencement the contracts are tested and the situation thereafter is much more clear. The examples shown (Table 5.5) illustrate how only after the operation starts all the legal implications became apparent (Lusoponte), how the uncertainty connected to legal issues can extend through the whole life cycle as in the JSCSC and the potential application of the Humans Rights Act and how it is important to check all laws and regulations before signing the contract (JSCSC).

Table 5.5. Legal Uncertainty

LUSOPONTE	JSCSC
The concessionaire assumes full acceptance of the risk associated with changes in general law or taxation. The only exception is changes in regulations that affect directly and adversely the operational revenues of the crossings. Legal Due Diligence investigation checks the adequacy of existing legislation with the contract responsibilities, and was done before final signing of contract by the banks to ensure that all contracts accord with the Portuguese and UK law Of all the contracts concession, warranties, intercreditor, etc only the security agreement has to accord with Portuguese law only. This is a crucial contract for the banks because it is the warranty against their financing and all assets given as a warranty are in Portugal and any disputes must be ruled in a Portuguese Court. Given the intricacies of Portuguese law it is sometimes difficult to adapt the contract to UK law. The reverse is not true. All the other contracts are usually drafted according UK law, and are easily accepted.	The concession contract (and 28 schedules) became an implied document in the construction contract. Therefore the requirements of untried/untested PFI concession became an implicit feature of all contractual negotiations. The full implications of the implied terms where not recognised in Guaranteed Maximum Price (GMP). Hence the reason for constructors costs escalating from £88 million to £120 million with no change in GMP.
In spite of all Due Diligence investigation problems occurred with Via Verde - One related to alterations in the existing contract with Brisa and another with a legislation gap. After the signing of the contract but before taking over the operation of the 25th April crossing it was found that the conditions of the existing contract with Via Verde were changed (from the time of contract signature?). This led to claims against the grantor. Also the transgressions on Via Verde led to legal problems When a car without transponder crosses Via Verde it is registered and a procedure starts to recover the payment and fine. When the concession was signed it included obligations against the transgressors, but in reality there was a gap in the legislation and Gestiponte didn't have effective power. It took four years to update the legislation and give Lusoponte the power to issue notifications against the offenders. Now if the offender is not immediately stopped and notified by the police, a notification for voluntary payment of a fine and the tariff is mailed. If it is not paid (the majority are) the process proceeds to courts (which is costly). Lusoponte recovers 40% of the fine and the due tariff.	**Planning regulations surprises and Construction approvals**: Traditionally UK Government Departments have been exempt from Local Authority Planning Approval Procedures (Although by custom and practice they have tried to comply). At the time of the contract's signing Laing Construction (L.C.) assumed that the construction was approved by the Local Authority Planning Department and had the construction works ready to start when they were informed that the building would only be approved if was 2 meters deeper than planned. The immediate major adverse consequence was that the building's foundations reached a very bad soil instead of rock as planned, and consequently costs escalated.
When Gestiponte started operating the 25th April crossing, violations accounted for up to 5 per cent of all transactions. The installation of more accurate equipment and a sensitisation campaign for the users enabled the reduction of the level of violations to 1 percent of total tolled traffic.	**Humans Rights Act (HRA-1998)** - and its application commencement in October 2000 gives local citizens a statutory right of appeal against infringents of personal rights/freedom. There is a strong body of legal opinion that Government bodies (and by implication their agents such as the concessionaire) cannot interfere with their rights by claims to Crown Immunity, as was previously done. Therefore any "local" complaints about planning and or Construction Approvals could potentially lead to a claim under the HRA (1998).

5.4.5 Bidding Uncertainty

Indáqua and JSCSC projects exemplify bidding uncertainty (Table 5.6). The uncertainty is related mainly with the need for adequate information to prepare and negotiate the bid. The uncertainty decreases as time progress and theoretically should end when the contract is signed. What happens in reality is that very often the contract is signed and not all issues are clarified. Consequently the bidding uncertainty extends beyond the point of contract signing carrying the uncertainty of unresolved issues.

Table 5.6. Bidding Uncertainty

INDÁQUA	
Low Quality of Information - The bidding risk is related to lack of and erroneous information that can lead to the inability to take decisions, or alternatively to make the wrong ones. After the signing of the contract, it became clear that clarifications, interpretations, etc., were still needed. Clearly a sign that the information provided during the negotiations was not completely adequate	The information brief was considered by L.C. to have been not clear enough; the construction requirements were loose and with open-ended solutions leaving too much room for interpretation to the lead designer that felt free to interpret the client's wishes as to what the building was supposed to look like. The consequence was that the contract was signed with inadequate information to correctly budget the construction works.
No clear objectives - The Public partner has to have a clear idea of the objectives, before issuing the tender. Apparently clear objectives were not defined. This has over-extended the negotiation period	At the start of construction only 5% of the drawings were available. Their quality was poor, impossible to estimate from effectively, which was problematic since the construction contract was budgeted according to the philosophy of Guaranteed Maximum Price. This methodology to be valid requires the assurance of ~80% of the design of what is going to be built. But at the time of signing the JSCSC construction contract not even 50% of the design was known, making it impossible to budget correctly. Even the materials choice was done as construction progressed, for example, it happened that as image was a big issue L.C. was forced to use walnut for the doors instead of a cheaper material.
JSCSC	
Poor Information - An Industry Briefing Day was held by the Ministry of Defence (MoD) to provide the interested companies with sufficient information to enable them to make an informed decision on whether or not to bid. Topics typically covered were: background information, how the service is currently being delivered, the service requirements, the project timetable and other sources of further information.	

A good example is the Indáqua project where the bidding uncertainty during the operation stage is derived from the need of clarifications, interpretations regarding the non-compliance with contractual agreements, and from not clear monitoring procedures of the Municipality to the construction/services. Nevertheless, in this project, contrary to what happened with the JSCSC, there was the establishment of a Partnership Approach to the Negotiations. The complexity of the contract has led to extensive negotiations and special care was given to establish good relations between the authority and the concessionaire. This approach has helped to solve many of the problems

encountered.

Another issue related with bidding uncertainty are bidding costs. Experience and information from other projects play a very important role. Knowing how to deal with these processes is very important, as cost reductions can be huge. In the Indáqua project the public and private partners fully assumed their respective bidding costs. These are usually high and at a total loss to the private partner if they don't win the bid. For the Municipality this was the first project undertaken using project financing and their costs went up to 500 million escudos. They estimate that the experience and knowledge gained with the negotiation of this contract would make it possible that on future negotiations the costs will be reduced to about 200 million escudos.

5.4.6 Construction Uncertainty

Construction uncertainty is related with all the issues that can potentially conduce to cost or time. Table 5.7 describes the most important issues raised in the JSCSC and Lusoponte projects and that caused unforeseen delays. Typically the uncertainty starts at high levels when construction begins because it is then that the real site conditions are tested.

Table 5.7. Construction Uncertainty

JSCSC	LUSOPONTE
Site conditions - One of the main problem that L.C. encountered related to the site conditions is related to Ground water. Bad ground and excavations below water table occurred in excess of all reasonable expectations at tender stage. The 1:200 floods caused a significant alteration in ground water levels and ground water content. The requirement to deeper excavations for foundations by a further 2 metres increased the volume and technical complexity of earthwork and sub-structure activity. L.C. having agreed a Guaranteed Minimum Price with the concessionaire did not lay-off its risk to their sub-contractors. The construction sub-contracts were largely "traditional" and allowed sub-contractors to send and obtain reimbursement for variations in the works. **Poor drainage** - One of the main problems encountered was poor drainage after the heavy rains of the first winter after delivery of the building. This might be related to the alterations requested by the planning departments to lower the building 2 metres. It happened that L.C. had already built the drainage network before knowing of the alteration, and although they were removed on paper as the pipes were already in place actually they were not removed, which might have caused the flooding of the building. An example of trying to comply with planning requirements: The documentary evidence was amended to suggest compliance whilst the physical works (already executed) were not amended. If this should cause local flooding problems in the future, there is the possibility of an action under HRA 1998 by "local residents". NB: These "local residents" could even be the occupiers of the military family homes on site, who historically have been unable to take any actions against MoD (and agents) because of claimed Crown Immunity. Once again DM have an unknown potential liability. **Co-ordination problems** - There were sequencing and programming difficulties, that for example, led to the scaffolding sub-contract in the final account amounting to plus 87% over tender, that is £560,000 in excess of L.C. estimate. **Labour shortages** - L.C. experienced serious labour shortages as the Swindon area is very buoyant with few people available that can be employed as carpenters, electricians, etc. **Latent Defects** - After delivery there was a 3 months period of snagging to correct construction defects. A final inspection will be performed one year after delivery to assess if all defects were corrected. There is a period of 12 years during which L.C. will be liable for latent defects. As mentioned, all the problems encountered meant that the GMP contract of £88 million would in reality cost L.C. £120 million.	**Delays in contract signing**: The detail design was developed during the construction stage, and work could only start after GATTEL's approval. Because of the delays in signing the contract, and to assure that construction could be completed according to schedule it was necessary to: • Support additional temporary site installation costs. All the resources needed for construction were made available by the French partner even before the final approval. While waiting for the 'green light', they undertook minor works. In the end this measure, although costly, paid off because construction could begin the day of the final approval, and it was not necessary to wait for the mobilisation of resources; • During this period the design team was developing work at Lusoponte's risk; • Novaponte commenced construction at its own liability in July 1995 before GATTEL's approval. **Structural adjustments:** The crossing was designed to last 120 years, so special care was given to the structure. This resulted in additional costs and/or delays because: • The driven piles were supposed to be 60 metres deep, but instead it was necessary to go up to 100 metres deep, greatly increasing costs; • The intertidal zone of the piles has twice the anticipated thickness of concrete to prevent corrosion of the steel cables. • The unavailability of land considered in the proposal for temporary site installations and consequent need to relocate and split up such installations **Completion**: The Vasco da Gama Crossing has been in operation for two years but the construction risk has not been extinguished, because the outstanding works were expected to be finished by the end of December 2000. After the Final Inspection Report, Lusoponte will issue the Final Acceptance Certificate to Novaponte. It's shareholders confirmed their commitment to carrying out all works necessary to achieving Final Acceptance Certification. They are fully liable for completion. The Inspection Report acted as a pressure instrument during the period when all disputes and claims were pending. The one-year defect warranty period (after delivery) has now expired. The question now is the definition of delivery. After two years in operation there are issues that arise and that are related with the usage of the asset, and it becomes difficult to distinguish between those and problems related with construction that should be covered by the defect warranty. After the Final Acceptance Certificate by Lusoponte, there is a one-year warranty for a 12-month maintenance period, during which any minor defects, imperfections or faults have to be remedied. For latent defects there is a 10-year (after Final Acceptance) performance warranty. The consortium Novaponte will be dissolved after finishing construction but the liability is transferred to the shareholders.

Typically construction uncertainty decreases throughout the construction stage reaching zero when construction finishes. This decrease can be linear (more or less) or in stages coinciding with the completion of the most important construction stages. Figure 5.7 illustrates the situation for roads where the stages are: Ground Works, Drilling, Tunnels and Special Structures. In a real life situation, the profile would be more complex with several active work fronts.

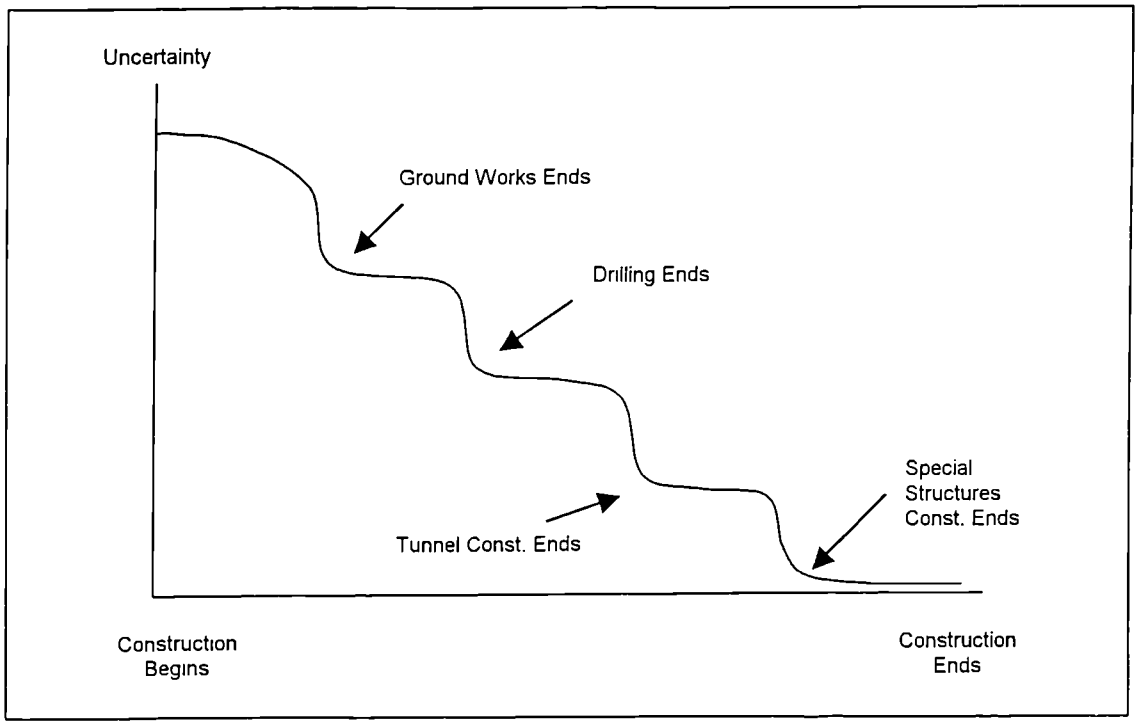


Figure 5.7. Uncertainty Decreases during the Construction Stage of Roads

5.4.7 Design Uncertainty

The design uncertainty is related with the availability and quality of the drawings and with the adequacy to the specified services requirements. Uncertainty decreases throughout the construction stage presenting a slight increase after service commencement due to the possible existence of defects that only become apparent after service commencement because it is only after the actual start that the structures are tested and latent defects become apparent and have to be correct within the warranty agreed terms (3- months to one-year). Afterwards uncertainty still exists as there is a period of several years when the constructor can be liable for latent defects.

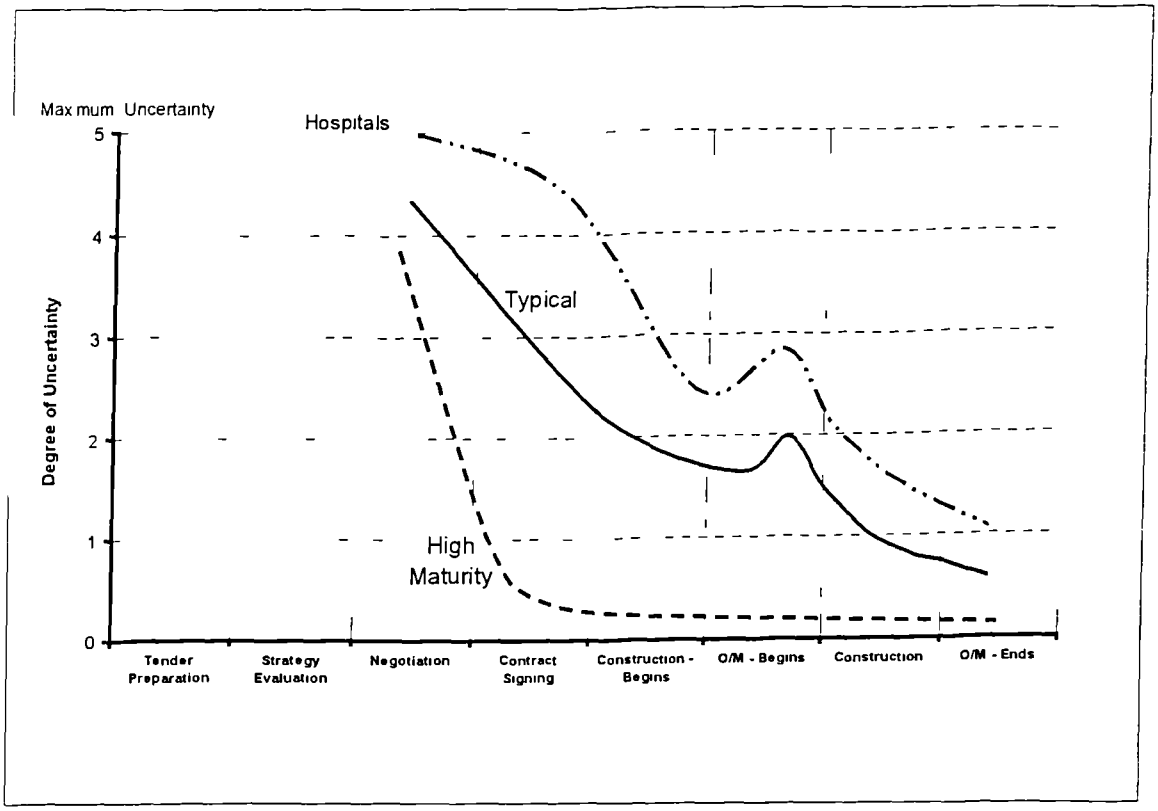


Figure 5.8. Design Uncertainty

From the data collect it emerged that the design uncertainty trend is strongly dependent on the maturity of the PFI market sector. Figure 5.8 illustrates three situations: the most typical where uncertainty slowly decreases as construction progress; the top line illustrates the situation found in the hospital sector widely acknowledged as a complex high-risk sector with too many decision centres - uncertainty is very high and only when

construction is at mid-term it starts to decrease; and finally the bottom line found in sectors like the prisons sector, or fire-stations, where the majority of uncertainty is dealt with a priori contract signing.

Underlying the different lines is always the question of how much of the design is complete at the moment of contract signing. In the hospitals sector the definitions of detail design are dealt with during construction by a large numbers of interested parties, like the heads of department. This situation has the potential for disputes and hence uncertainty remains high. In contrast, in the prisons sector design is well established, proven from previous projects and there are clear objectives, so typically 90% of the design is established at the moment of contract signing and declines steeply afterwards.

Insufficient specifications were already discussed previously and are also related with design uncertainty. The examples in Table 5.8 were drawn from the Lusoponte and JSCSC case studies.

Table 5.8. Design Uncertainty

LUSOPONTE

The main difficulty encountered was the need to comply with the construction schedule (that was already very tight) co-ordinating the delivery of the designs so that the constructors wouldn't be stopped by a lack of design details.

During construction, GATTEL imposed several modifications to the preliminary and construction designs. These caused significant delays in the relevant approvals besides the additional costs incurred by changes in the nature of construction works and the need for land availability. The delays also caused significant onerous acceleration measures to ensure timely completion. This led to claims by Lusoponte that amounted to 25 billion escudos. The most important were:

- The reformulation of the link to Pc. Jose Queiroz on the Northern Bank. The initial project was for a level connection, which was soon discarded. In Oct. 96 the connection was not yet defined. One of the main reasons for the delays was the need to coordinate all intervening authorities: GATTEL, EPAL (Water company because of the Alqueva Aqueduct), Municipality of Loures and Lisbon, Expo98 and the Lisboa and Vale do Tejo Regional Coordination Committee;
- A similar situation involved the Southern connection, also involving the need to coordinate several entities, among which the Brisa (concessionaire for motorways) and JAE (Roads Authority);
- The reformulation of Sacavem Interchange, also involving increased construction works. Extra cost amounted to 3 2 billion escudos;
- Remediation.

JSCSC

Poor design procedures Laing devised The Review Process themselves but it proved to be very bad for the progress of the construction works. It introduced delays because construction could only start when there were no comments from every partner. The Review Process was an iterative process with the following stages:

- First, the architects produced the drawings;
- The drawings were sent to a review committee composed of: MoD, Serco, planning and building control. They had 20 days to comment;
- The drawings were redone and resubmitted to the committee;
- This process would repeat itself until there were no comments.

But *"No comment"* didn't mean, *"I agree"*, which meant that later problems could surface. Effectively, it happened that long after construction commenced problems were raised. For example, there was only one overworked planning officer in the municipality, who although issuing a "No comments" would raise issues long after because it was then that he had time to analyse the drawings. Also the fire department stated afterwards that construction was not in accordance with safety regulations. The usual way to proceed is to present the drawings for comments, and after receiving comments proceed with construction.

Designs were not timely - Often the plans were revised, with the annotation that there were only minor alterations, which in reality would mean alterations in 50 items. Schedule revisions were constant, which was very disturbing because it was a tight schedule as L.C. had to deliver the building already equipped on 6th September 2000. Otherwise it would mean a one-year delay in starting operation, as the academic year would be lost. Design evolution was accompanied by panic control. The difference between the ideal delivery schedule and as it was in reality was enormous. The construction sub-contractor had the majority of the drawings in his possession only near the end of the construction period, whilst its delivery by the designer should have been smoothly phased from the beginning of construction.

Service Specifications - "Fit for purpose" was introduced in the construction sub-contract to characterise the service specifications of some construction items. It proved to be the origin for several problems, because the purpose can change depending on the client's point of view. The most striking example is the 'Fit for purpose' of a fire escape: outside the bar there is a fire exit with a balcony and stairs to the ground. It happened that during the commemoration of Victory in Europe (VE) Day people who were at the bar, went out to see the planes flypast and the excessive weight caused the balcony to bend. It was designed for people to pass through not to stand, but as it didn't prove in that particular circumstance, L.C. was forced to redesign it and rebuild it as it was "not fit for purpose". It is important to note that the concept of 'Fit for Purpose' is uninsurable, no one insurance company will accept to cover this risk, and it is the constructor that takes the risk not the designer.

5.4.8 Commercial Uncertainty

Commercial uncertainty, or uncertainty in the project's revenues, is present when dealing with a free-standing project where the clients pay for the service (Lusoponte, Indáqua). With a DBFO the client needs are predefined and it is the public sector that pays for the service level of usage as in shadow toll roads, or service availability as in schools according the contracted service specifications (Victoria Dock Primary School or JSCSC). It is not a real life market driven situation and it occurs in several sectors like prisons, schools and fire stations.

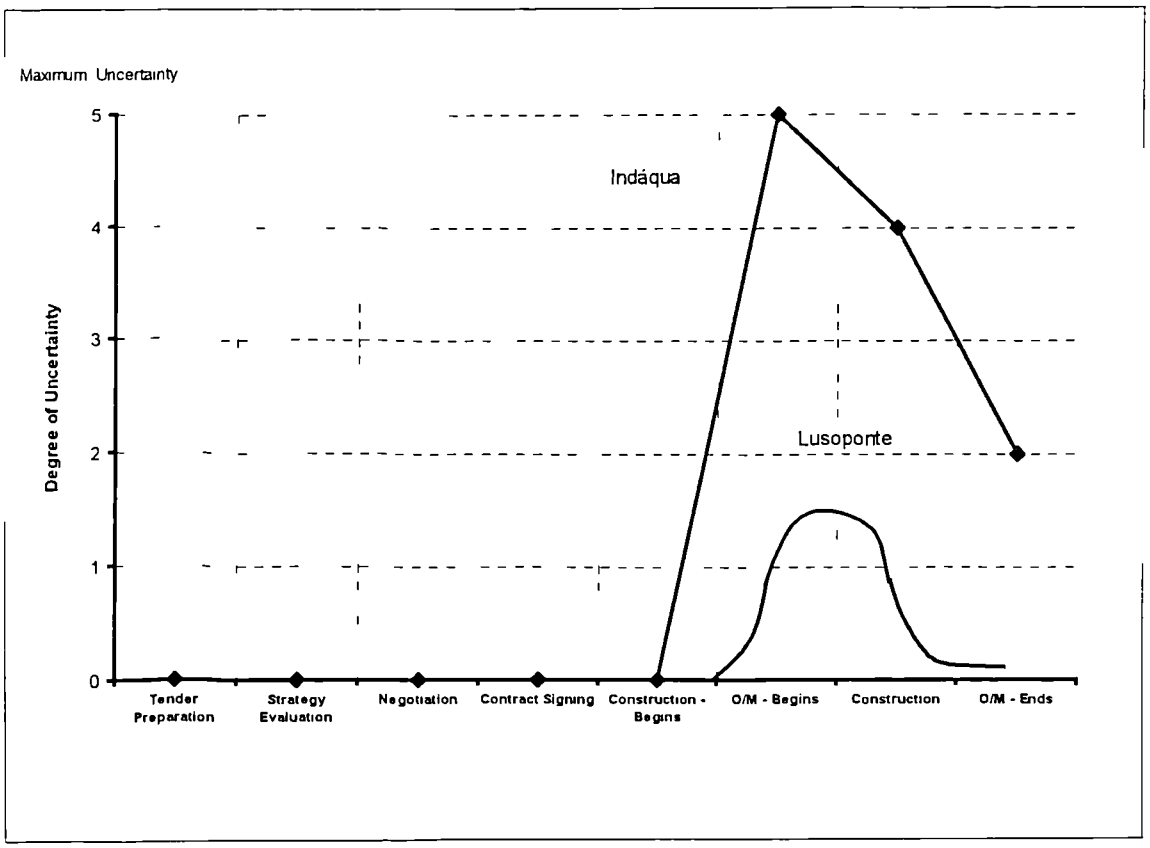


Figure 5.9. Commercial Uncertainty

As for the long-term perspectives of a free-standing project, it is clear that uncertainty increases with time (Figure 5.9); the private sector always assumes some risks. In Lusoponte the private partner assumed totally traffic risk, but as it is considered a low risk sector uncertainty is comparably lower than in Indáqua. The maximum of uncertainty is in-between 10 and 20 years. It is new infrastructure so it is relatively difficult to predict its impact, but after 20 years the market situation will be relatively

well known, hence a decline in uncertainty.

Table 5.9. Commercial Uncertainty

LUSOPONTE

Traffic Risk has been accepted by the private sector. One of the reasons for the inclusion of the operation and maintenance of the 25th April crossing was to mitigate traffic risk, and consequently to diminish risk for the overall project. Both crossings connect the urban area of Lisbon to the south bank, so it was reasonable to assume that traffic would be diverted, the extent of which was very difficult to predict. Whereas when considering combined traffic the uncertainty is much less. The other underlying reason was to obtain revenues to partially finance the project.

Traffic depends mainly on:

- **Timing and development of the south bank;**
- **GDP Growth affecting Car Ownership**: In 1998, the Lisbon area had 421 vehicles per 1000 inhabitants, and in Setubal (south bank) 319 vehicles per 1000 inhabitants. Saturation is believed to be about 600 vehicles per 1000 inhabitants;
- **Level of tolls**: People always look for cheaper alternatives. Both bridges have tolls only northbound. It is noticeable in the traffic statistics that some drivers enter Lisbon from the south by the 25th April Crossing, which is cheaper (150 vs. 320 escudos) and leave town by the Vasco da Gama Crossing, which has no traffic jams and no tolls in this direction. The difference in traffic northbound and southbound is superior in the 25th April Crossing where 5000 cars more enter Lisbon than leave, while that on the Vasco da Gama it's the reverse: there are 2000 more cars leaving Lisbon than entering.
- **Impact of fuel price increases** - In Portugal the Government sets controls on fuel prices imposing a maximum price to the public. In March 2000, the time of the first increase in fuel prices, there was a decrease in traffic during the following two months, after which it returned to the previous levels. The price increase that took place in January 2001 (+5 escudos per litre) was small with negligible negative impact. By the end of 2001 it is expected that the government will liberalise fuel prices, which will undoubtedly mean a much higher price increase (between 5-30 escudos). It is important to note that if this price increase coincides with an interest rate increase, and consequently an increase in mortgage loan repayments, the impact will be especially significant because the great majority of commuters are low to middle income young couples who moved to the southern bank because of cheaper housing;
- **Lisbon traffic restraint policies;**
- **Competing transportation modes – Rail link** - The negative impact seems to have been overestimated. It is operating above expectations, but this either released suppressed demand or captured traffic from buses (Barraqueiro cancelled their buses) and ferries. As a result the 25th April Crossing has reached full capacity one year after the opening of the sixth lane, instead of the anticipated 3 to 4 years;

Impact of Carregado bridge upstream of Vila Franca de Xira - There is always the possibility to construct another crossing outside the area of Lusoponte's concession, upstream of Vila Franca de Xira just beyond the concession's limit.

INDÁQUA

The commercial risk depends on the revenues from the services provided. The revenue level is affected by the following four main factors:

- Adoption level (before construction 20% for water, and 4% for the wastewater sewerage);
- Demographic evolution of the municipality;
- Water per capita consumption;
- Payment risk.

The commercial risk allocation is split among the municipality, the concessionaire, and the consumers. If the concessionaire is under certain adverse conditions the consumers carry the risk through increased tariffs. It is important to note that the consumers are not homogeneous. There are three segments: domestic, commercial and industrial. Each one has different needs and their future evolution differs too.

Adoption level – This is the most important risk assumed by the concessionaire. It is expected that the majority of new consumers will connect to the service during the construction stage. It is very expensive and inefficient to make the connection to a consumer after concluding the installation of the main pipes.

Marketing campaigns are scheduled to promote the connection particularly to the wastewater sewerage network. The connection to the wastewater sewerage is critical, because it is not legally mandatory and is generally considered to be the most profitable segment of the business. Its need is still not very well understood by all consumers, as they are used to discharging (at no cost) the wastewaters without treatment and now they would have to pay for that service.

Demographic evolution – The demographic studies are the municipality' responsibility: if the population evolution proves to be 10% less than the forecasted, there will take place an automatic mechanism for the renegotiation of the financial equilibrium of the concessionaire and the tariffs will be raised. It is considered that for the demographic evolution very conservative estimates were used hence this risk is small.

Per Capita Consumption - If per capita consumption is 10% less than of the forecasted, tariffs will be raised.

Payment Risk - Historically, the payment risk (billing risk) is low, as it is an essential service and in the case of non-payment it will be discontinued. The weight of the water bill in the overall budget of the consumers is reduced and an upward margin of 20% would be acceptable. This explains why the other concessions have already increased prices without any problem (initially they were supposed to lower the prices), adjusting the prices to the operational costs. For example, Aguas do Cavado was planning to reduce the price and instead raised it from 50 to 65 escudos/m3.

Depending upon the specific characteristics of the market the revenues are affected by different factors. Table 5.9 describes the Lusoponte and Indáqua risks together with the viable mitigation measures implemented. For Indáqua the commercial uncertainty depends on two factors: demographic evolution and adhesion level. It is perceived that the later is the most important, so once operation starts, as the consumers connect to service uncertainty declines, but never reaches zero level as the population growth is never a complete certainty.

Conversely at Indáqua the long term commercial risk assumed by the private sector is considered to be of high uncertainty – a new market affected by many factors although with risks mitigated by the imposition of maximum thresholds of variation.

5.4.9 Operation and Maintenance Uncertainty

Operation uncertainty starts at the beginning of service provision and increases as times progress. The uncertainty is related to the unforeseen operational problems that can affect the service specifications thus introducing financial penalties (JSCSC), or that can cause higher operating costs thus affecting negatively the project's cash flows (Lusoponte).

Table 5.10 describes two examples drawn from the Lusoponte and JSCSC case studies. In Lusoponte the main issues were related with higher than expected costs of toll collection procedures, while with JSCSC the emphasis was on the need to comply with the complex system of service specifications. Somewhat surprising, staffing proved to be a major operational issue.

Table 5.10. Operation Uncertainty

LUSOPONTE

Higher running costs of Via Verde: The Via Verde is an electronic toll charge in operation on all Portuguese toll highways. The car has a transponder that identifies the vehicle, its class, and activates a direct debit to the driver's bank. It permits 1200 car crossings/hour instead of an average of 250 cars/hour (some manual operators in peak time can reach up to 480 cars/hour).

The electronic tollbooth creates more costs per car (costs per transaction) than the manual tollbooth. There are bank costs, processing costs, mailing costs and the costs incurred by the non-payment (cars that go through without paying) and subsequent procedures to try to recover payment. In the base case all these costs were accounted for, but what happened was that the increased utilisation of Via Verde was much higher than expected, and consequently the costs were higher than expected.

Non payment of Via Verde When a car without a transponder crosses Via Verde it is registered and a procedure starts to recover the payment and fine. This is a costly procedure, so on one of the two Via Verde lanes on the Vasco da Gama Crossing a gate was installed that only opens when the car is properly identified. Another example occurred when Gestiponte started operating the 25th April crossing, violations accounted for up to 5 percent of all transactions. The enforcement system using a video recording, and the legal process, didn't allow the prevention of violations or an effective recovery. It took four years for the government to adjust legislation and give Lusoponte the power to issue notifications against the offenders. The installation of more accurate equipment and a sensitisation campaign for the users enabled the reduction of the level of violations to 1 percent of total tolled traffic.

Inheriting an old system - Before Gestiponte took over operation of the 25th April Crossing, but after the signing of the contract, they found out that there were major deficiencies in the toll collecting system. The manual system was completely revised to improve the control and monitoring, from the moment the toll is paid to the reconciliation phase. This has led to claims against the grantor.

JSCSC

Service Provision Control - The operational risk, i.e., the risk that the private partner would be financially penalised by an unsatisfactory service, has been controlled as this is a self-monitoring and benchmarked project. The Self-performance Monitoring Criteria assess the performance of the services provided against a benchmark that was negotiated within the contract with the MoD. This benchmark is still negotiable and it will be revised after one year in operation. The system is considered "fair" by both partners and is based on trust. The MoD has preferred to opt for this solution, according to the partnering approach adopted, instead of having a team on site to do the "contract monitoring". Usually this involves 12-16 people at a cost of at least £250,000/year, and that might not have a positive perspective to solve problems. The actual system involves penalty points for specific events, that if exceeded will induce a financial penalty. The information system interlinks this data on-line and the managers of the various departments have access to it.

The system consists mainly of a set of tables describing the events, for which a pre-determined number of points is attributed according to the occasion on which they take place: Normal, Audit or Key Events (Very important days when key events take place, usually involving about 12 days a year). If the event takes place in a Normal day the points to attribute will be the pre-set benchmark, if the event takes place on an Audit day the benchmark is multiplied by two, and if it happens on a Key event day it will be multiplied by three since it very important that service should be flawless.

Each manager has a standard template to fill in, and on a daily basis can control the number of points attributed and compare them with the benchmark. The system works on a 3-months basis, thus giving a good margin to correct problems.

Staffing Problems - The Mess Services – catering and cleaning were sub-contracted to Eurest. At the beginning of operation Eurest had big problems with staffing. The area where the JSCSC is located is 3000 short in labour positions (i.e., in the area there is an average of 3 000 employment vacancies). Eurest had underestimated the problem and as such it caused major problems with the performance monitoring system. According to this system if the agreed levels of performance are not attained Serco's payment by the MoD is penalised. The turnover of the personnel was excessive – few stayed for longer than 2 weeks - and staffing was further complicated by the need of being security cleared an average 50% wouldn't pass.

So far Serco has not been financially penalised, and having opted for a partnering approach they worked in conjunction with Eurest to work out the best solutions. One year after service commencement this problem has been reduced, performance has improved and Eurest has managed to get a good set of supervisors. Currently Eurest employs 160-180 persons, probably needing a further 10-12. They get employees from as far as Oxford (30 Km).

The uncertainty associated with maintenance naturally increases as time progress but the trend is highly dependent on the specific project. Two examples draw from data of the following projects: Lusoponte, and Victoria Dock Primary School and illustrate two different situations (Table 5.11).

In Lusoponte there is a very specific trend associated with the technical characteristics of the structure (Figure 5.10) with a cycle of 25 years related with the characteristics of the cables, pillars, expansion joints, etc., and the replacement of control equipment. In the school the main concern was to reduce maintenance costs and potential maintenance problems.

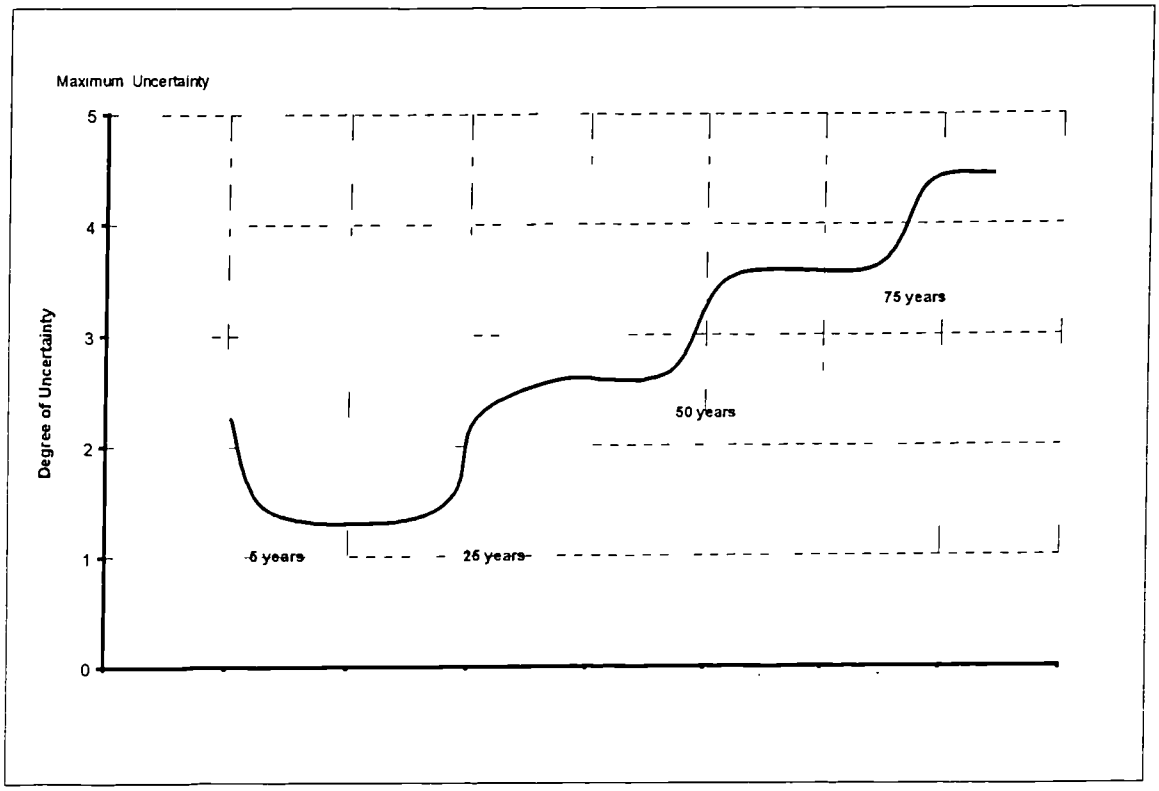


Figure 5.10. Long Term Maintenance Uncertainty in Lusoponte

Table 5.11. Operation Uncertainty

LUSOPONTE	
The O/M team was involved since the beginning of the project to evaluate the adequacy of design to simplify O/M, keeping its costs at the minimum possible level. For example, the access to the South Viaduct structure for routine inspections (check sensors, support apparatus, etc), were planned from the start: The existing suspension cables would not permit a cradle installation to accesses under the deck for inspection. The O/M proposed a project modification: the installation of a small fixed platform for inspection that would run beneath the 800 metres long deck. This resulted in a much more efficient maintenance programme.	Uncertainty increases with the passing of time because no one really knows the behaviour of concrete during 120 years, which is the projected life of the Vasco da Gama bridge. Concrete was introduced in the 30's and it was supposed to be eternal, which is now known to be untrue.
After service commencement the risks and uncertainties remained high and constant during the first years (2) as the structure stabilizes and settles. Also the well-known phenomena that some electronic equipment (2%) will fail during the first two years, the reaming will perform well during their regular lifetime for 20 years. During those first years monitoring is detailed and intensive, but with the passing of time the behaviour of the structure becomes known with less uncertainty and less monitoring is needed. In those first years there are always surprises: The coils of expansion joints were loose and falling although they were according specifications.	VICTORIA DOCK PRIMARY SCHOOL
The degree of control and monitoring reduces uncertainty forcing the line downwards and stabilizing around 5 years, based on what is known about materials behaviour. As of 2000, some areas could be considered stable because they were built in 1993.	The school was designed to have low maintenance costs, paying special attention to reduce potential vandalism. For example they use external steel shutters (very uncommon in the UK) that although more expensive – higher initial investment and maintenance every six months - prove in the long run to be a good investment reducing (or stopping) the breakage of glass windows
After 20 years, and for 5 years, the electronic and support equipment has to be replaced having reached the end of its lifecycle, and the structural risks derived from the natural ageing of materials increase uncertainty. There is the need to replace pillars (there might appear areas where the concrete is damaged), beams and to make the maintenance of the structure and cables. This cycle repeats itself every 25 years.	As the school pays for their own gas and electricity great effort was made to design an energy efficient building (also not common in the UK). Some special features to reduce whole life cycle costs included are: double glazing windows, large cavity walls with air pockets to improve insulation, less expensive roof tiles that are replaced every 15 years instead of 25 years for the traditional aluminium foil, also they didn't insulate the concrete floor having considered that not much heat would escape thus saving the increased costs of insulation. Doors are painted (thus easier to repair) instead of varnished.
	To reduce vandalism and for security and respective recurring costs they have put thick plywood to the cover of the roof thus preventing people breaking in. So far the only vandalism has been graffiti.
	They have a security system sub-contracted to Prosegur.
	The school has a multiskilled and flexible 'caretaker' with the authority (empowerment) to solve simple tasks, like fixing a plug. More complex maintenance problems, like breakdown of pipes, an external company has to be used.

5.4.10 People Uncertainty

People uncertainty deals with risk attitudes and perceptions towards risk. Regarding the risk attitudes it is always beneficial that the risk profiles of the concessionaires coincide with the risk characteristics of the sectors. For example, Carden Croft - the risk averse concessionaire of the Manchester Fire Station - has opted for low risk sectors (Table 5.12). The human uncertainty derives mainly from the people's perceptions on how the projects will affect their own well-being: personal, professional, etc.

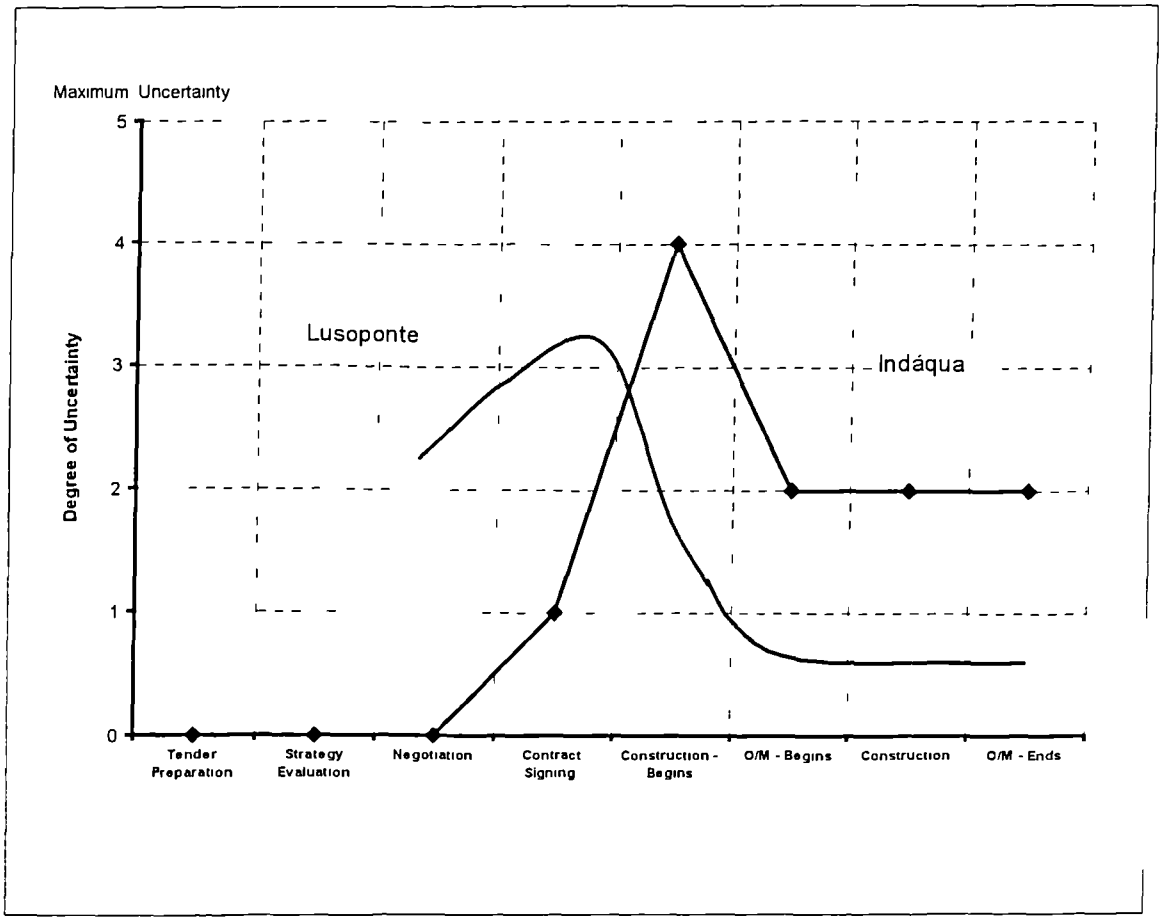


Figure 5.11. People Uncertainty

The human uncertainty profile of Indáqua (Figure 5.11) illustrates this dependency on risk perceptions. At the beginning there is a low uncertainty, followed by an increase as more players begin inter-acting (typically the peak is in the later stages of construction) and then decreases as people get to know each other better and establish (or maintain) good inter-personal relationships (Victoria Dock). Uncertainty also decreases as the employees see their professional situation resolved as it was the case of Indáqua where part of the Municipality's staff was transferred to the concessionaire.

Table 5.12. People Uncertainty

MANCHESTER FIRE STATION	INDÁQUA
Carden Croft, the contractor of the Manchester Fire Station, is not a risk taking firm and will always focus in low risk areas like the Blue Light sector. They discarded accommodation, technologically adjusted to their own know-how but where there is high uncertainty regarding the building's residual value because at the end of the concession this value might be seriously undervalued from the one expected.	In Portugal by law, in all concessions, the Municipality's employees have the option whether or not to be transferred to the concessionaire, with their previous rights and privileges always guaranteed. Indáqua Feira absorbed 30 employees that had to be trained and integrated into the culture of a private company. It is important to move them away from their old working environment, and give them better working conditions, like good changing rooms, etc. In this northern region, the unions are notorious for standing for their rights
LUSOPONTE	**VICTORIA DOCK**
At the beginning of the project and as more people are joining the team the uncertainty increases, reaching the maximum at the beginning (or middle when more people intervene)) of construction. In any case, it decreases sharply stabilising during O M with less people involved and that have become to know each other well	Paul Sewell had a very good and close relationship with the school's headmistress (was on a first name basis) and Sewell Group being a local company had traditionally good relations with the town councillors and the Education board. Throughout the process a partnership approach was used, promoting co-operation between all the parties involved. The decision taken by Sewell to promote a 'Community Dividend' has enhanced this approach. The Victoria Dock School PFI Ltd is to return a proportion of their profit to the community. As of 2000, it represented around £35,000 that went back to the school and was applied on special projects, like environmental – A Wildlife Wood was set up within the school grounds providing a wildlife habitat in an urban setting and an environmental focus for education.

5.4.11 Force Majeure

Force Majeure Uncertainty remains at a constant level throughout the whole life cycle of the projects, as by nature they are events for which there is no possibility to forecast.

5.4.12 Residual-Value Uncertainty

Residual Value Uncertainty existence depends on the contracts. Usually the asset is returned free of charge to public sector.

The next sections present the assessment of the quantification of risk uncertainty in Indáqua and Lusoponte.

5.5 WLCRUM Quantification

This section presents the quantification of the WLCRUM model for the PFI – Indáqua Feira, using MatLab as the analytical software to calculate the area beneath the uncertainty lines. This area represents the quantum of uncertainty. It used the function Mgrade that calculates the memberships grades of the domain elements in the fuzzy sets. The difference between crisp sets and memberships grades, is that the crisp numbers are assigned the value of either 1 or 0, while the memberships grades indicate that the values assigned fall within a range, i.e., introducing the notion that the number is not for instance 2 or 3, but about 2 or 3. According to Klir & Folger (1988) a fuzzy measure indicates the degree of subjective certainty that it belongs to the set and thus defined within the range 0 to 1. The Fuzzy Sets (Klir & Folger 1988; Zadeh & Kacprzyk 1992) methodology is an alternative to the Gaussian Methods of analysis being particularly adapted to uncertainty analysis and reasoning under uncertainty as it is based in feelings, vagueness and deals very well with ambiguity by eliminating the sharp boundary dividing members and non-members of a set. All the risks analysed are based on uncertainty and as such Fuzzy sets is a natural selection. The interviewees were much more comfortable to attribute a number to uncertainty that was not definite, but that would be *'approximate'*, that would look *'appropriate'* or that *'it looks like x% would be ok'*. Previous methods rely mostly on the Monte Carlo simulation with its corresponding probabilities and regressions, requiring precise numbers (still based on expert opinions) and therefore not so well adapted to the current research objectives.

Table 5.13 indicates the raw data obtained from the interviews to participants (expert opinions) in the PFI. For each type of risk, and for the most relevant dates it indicates the uncertainty on a scale 0 to 1. The values are therefore normalized enabling the comparison between different risks, and different projects

Table 5.13. Risk Uncertainty in Indáqua

	1996	1997	1998	1999	2000	2001	2008	2035	Uncertainty (Area)
		Bidd.	Negot.	Sign.	Constr. Beg.	O/M Beg.	Constr. Ends	O/M Ends	
O//M	0	0	0	0	.2	.6	.8	1	29.7
Commercial	0	0	0	0	0	1	.8	.4	23.0
Political	0	0	0	.2	.8	.4	.4	1	22.9
Econ./Fin.	0	0	0	0	.6	1	.4	.6	19.5
Residual Value	0	0	0	0	.2	.2	.4	.6	15.9
Legal	0	0	0	.2	.8	.4	.4	1	15.6
Human	.6	.2	.6	.6	1	1	.2	.2	12.8
Bidding	1	.6	.8	.6	.4	.4	.2	.2	10.6
Social	0	0	0	0	.4	.2	.2	.2	7.3
Force Majeure	0	0	0	0	.4	.2	.2	.2	7.3
Construction	0	0	0	0	1	.8	0	0	4.2
Design	1	.6	.8	.6	.4	0	0	0	2.9

Table 5.14 shows for each risk the graph of the evolution of uncertainty throughout the life cycle. The value of uncertainty is, as mentioned before, the area beneath the line. Included are also the values of x=years and y=uncertainty (Table 5.13), the script of the algorithm and the calculated result for the area.

The higher values of uncertainty are from O/M (29.7), Commercial (23.0) and Political (22.9) risks. Political uncertainty is clearly related with the change in governmental policy at the beginning of the project that caused so many problems. As could be expected both O/M and Commercial uncertainties with high values reflect the long-term nature of the project (30 years). It is interesting to note that construction uncertainty is very low.

For the PFI of Lusoponte a different approach was tried to collect data. Instead of asking for specific values, interviewees were asked to draw the lines. As a result the lines obtained were smooth and not possible to quantify using the functions utilized in

the previous example. It also used MatLab to compute a function that could be described by the data points. It was chosen *'splines'* which utilizes a polynomial logic to interpolate the points and calculates the best function that describes the lines drawn. It was then possible to calculate the area. Two examples are shown to demonstrate the potential for this method (Table 5.15). The values indicated are only approximate as it would be necessary to compute the values at regular intervals (required by this method unlike in the previous example). Nevertheless, while not using fuzzy sets that are in principle more adequate to the way people think about these issues, it has proved that with the adequate raw data it is a valid approach.

In conclusion, the WLCRUM was tested in PFI projects and proved to be a very useful tool to map uncertainty and force managers to consider the long-term nature of the project. The need to rationalize the uncertainty, and its underlying causes, over the future was mentioned as very positive. In this process some interviewees realized the existence of factors that could influence the project and over which it would be possible to act upon (to mitigate it). The WLCRUM model is an effective management tool.

The quantification of uncertainty is still in a very embryonic stage. Nevertheless it is one of the most promising research areas to develop.

The next chapter addresses the proposal for the model for CSFs in a PFI.

Table 5.14. Risk Uncertainty for Indáqua

% Risk Commercial Indáqua

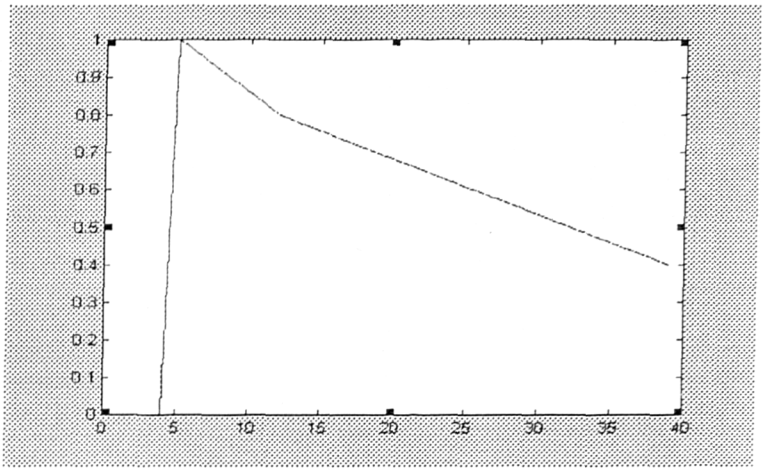
x=[0 1 2 3 4 5 12 39];

mgrade=[0 0 0 0 0 1 .8 .4];

area=trapz(x,mgrade)

plot(x,mgrade);

area = 23.0000



% Risk Ec/Financial Indáqua

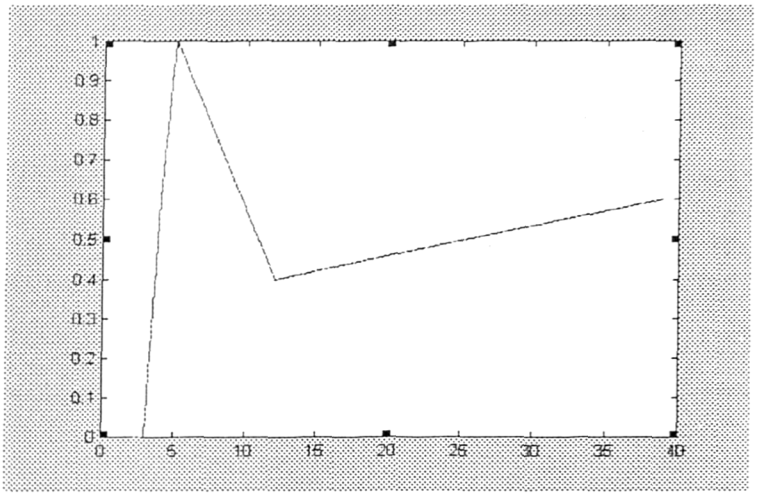
x=[0 1 2 3 4 5 12 39];

mgrade=[0 0 0 0 .6 1 .4 .6];

area=trapz(x,mgrade)

plot(x,mgrade);

area = 19.5000



% Risk Construction Indáqua

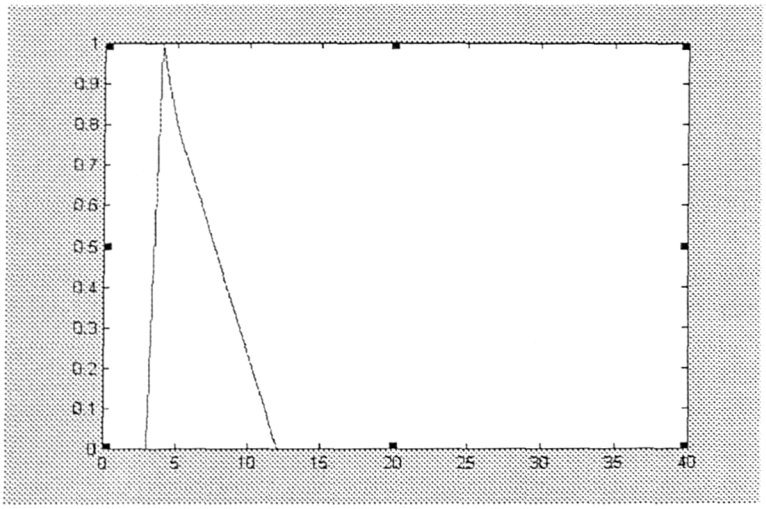
x=[0 1 2 3 4 5 12 39];

mgrade=[0 0 0 0 1 .8 0 0];

area=trapz(x,mgrade)

plot(x,mgrade);

area = 4.2000



(cont.)

Table 5.14. Risk Uncertainty for Indáqua (cont.)

% Risk O/M Indáqua

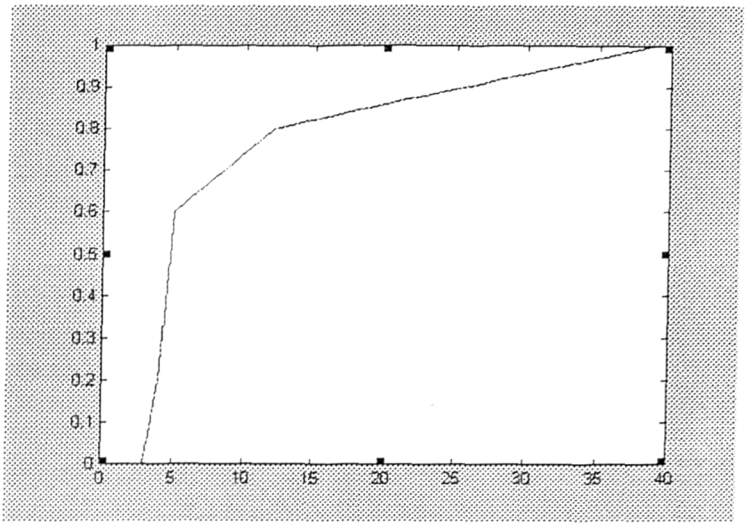
x=[0 1 2 3 4 5 12 39];

mgrade=[0 0 0 0 .2 .6 .8 1];

area=trapz(x,mgrade)

plot(x,mgrade);

area = 29.7000



% Risk Bidding Indáqua

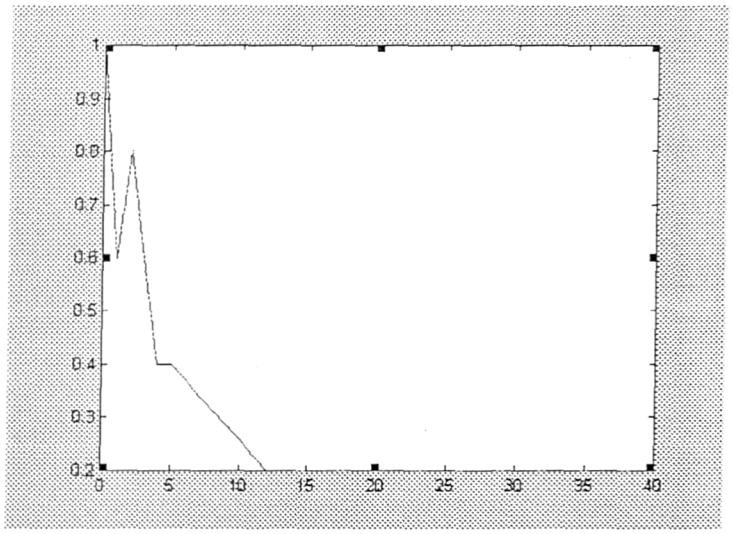
x=[0 1 2 3 4 5 12 39];

mgrade=[1 .6 .8 .6 .4 .4 .2 .2];

area=trapz(x,mgrade)

plot(x,mgrade);

area = 10.6000



% Risk Legal Indáqua

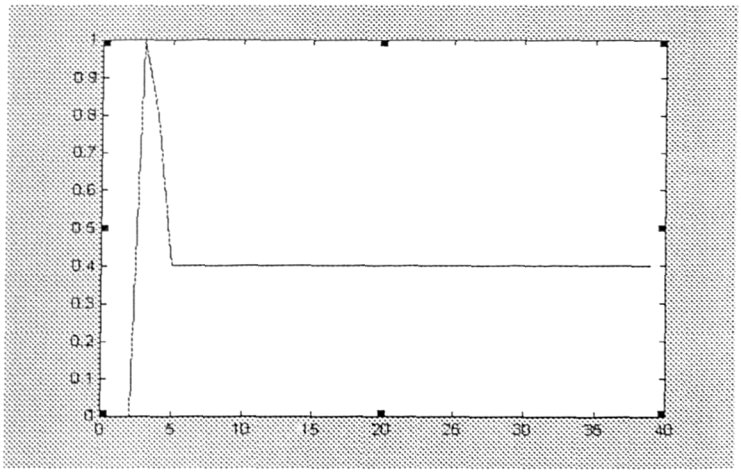
x=[0 1 2 3 4 5 12 39];

mgrade=[0 0 0 1 .8 .4 .4 .4];

area=trapz(x,mgrade)

plot(x,mgrade);

area = 15.6000



(cont.)

Table 5.14. Risk Uncertainty for Indáqua (cont.)

% Risk Political Indáqua

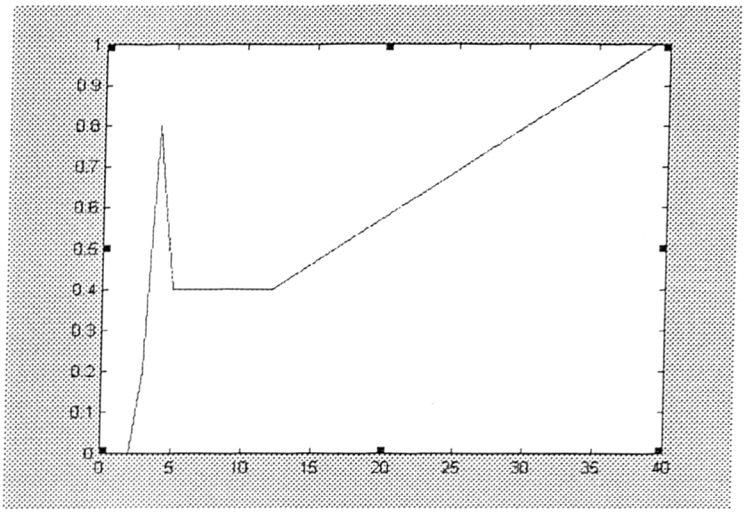
x=[0 1 2 3 4 5 12 39];

mgrade=[0 0 0 .2 .8 .4 .4 1];

area=trapz(x,mgrade)

plot(x,mgrade);

area = 22.9000



% Risk Design Indáqua

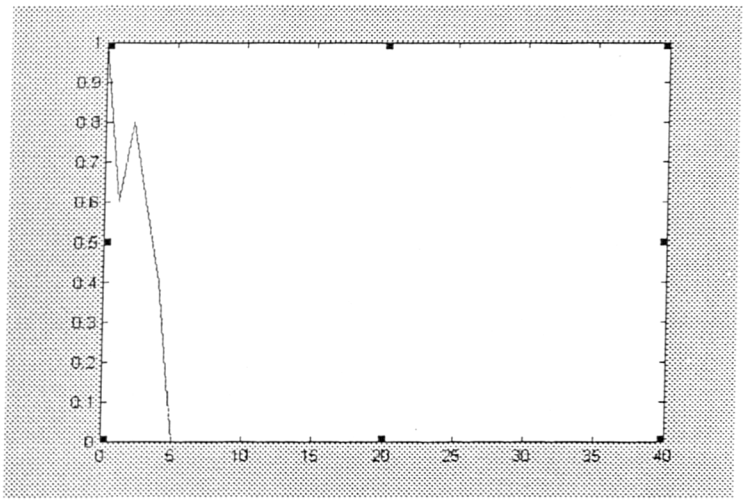
x=[0 1 2 3 4 5 12 39];

mgrade=[1 .6 .8 .6 .4 0 0 0];

area=trapz(x,mgrade)

plot(x,mgrade);

area = 2.9000



% Risk People Indáqua

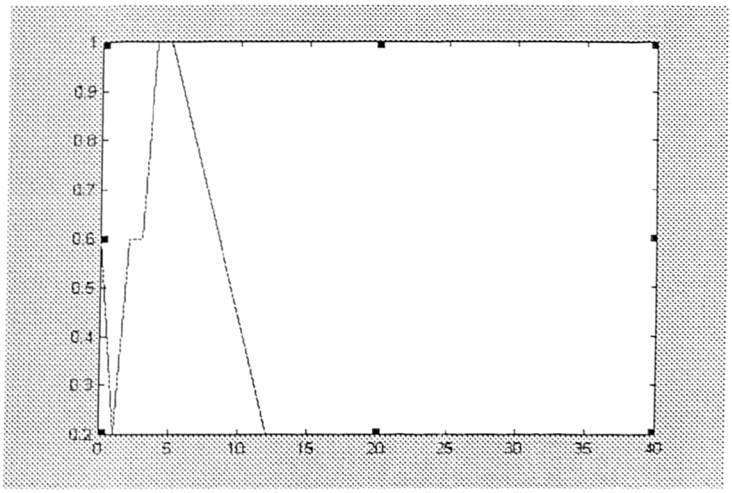
x=[0 1 2 3 4 5 12 39];

mgrade=[.6 .2 .6 .6 1 1 .2 .2];

area=trapz(x,mgrade)

plot(x,mgrade);

area = 12.8000



(cont.)

Table 5.14. Risk Uncertainty for Indáqua (cont.)

% Risk Social Indáqua

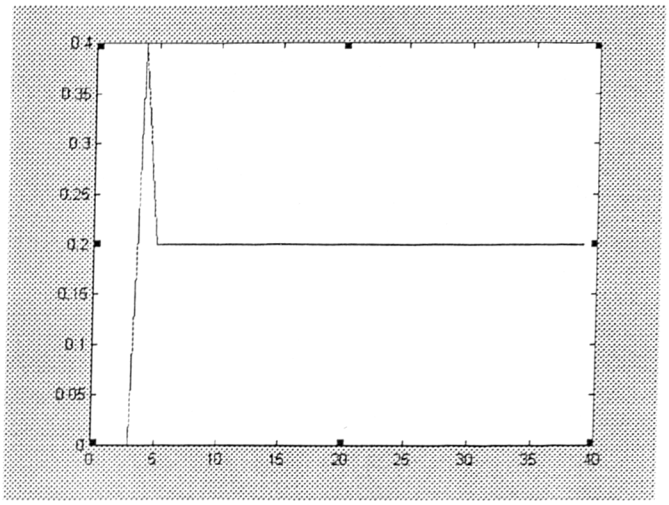
x=[0 1 2 3 4 5 12 39];

mgrade=[0 0 0 0 .4 .2 .2 .2];

area=trapz(x,mgrade)

plot(x,mgrade);

area = 7.3000



% Force Majeure Indáqua

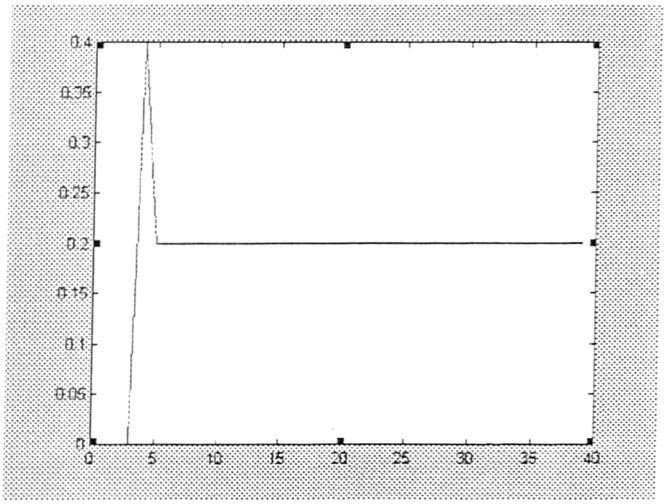
x=[0 1 2 3 4 5 12 39];

mgrade=[0 0 0 0 .4 .2 .2 .2];

area=trapz(x,mgrade)

plot(x,mgrade);

area = 7.3000



% Residual Value Indáqua

x=[0 1 2 3 4 5 12 39];

mgrade=[0 0 0 0 .2 .2 .4 .6];

area=trapz(x,mgrade)

plot(x,mgrade);

area = 15.9000

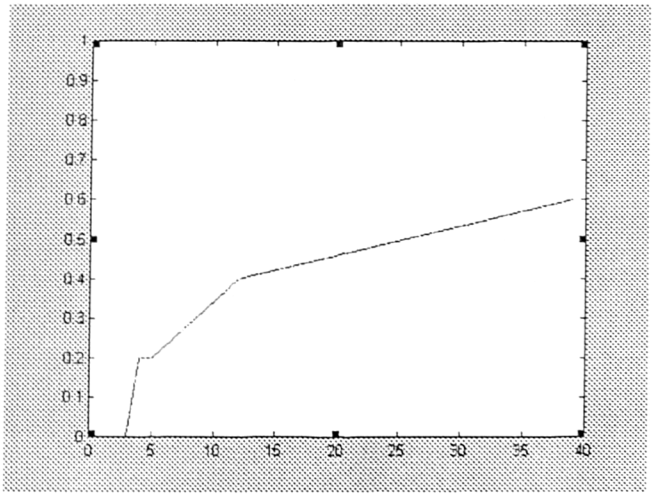
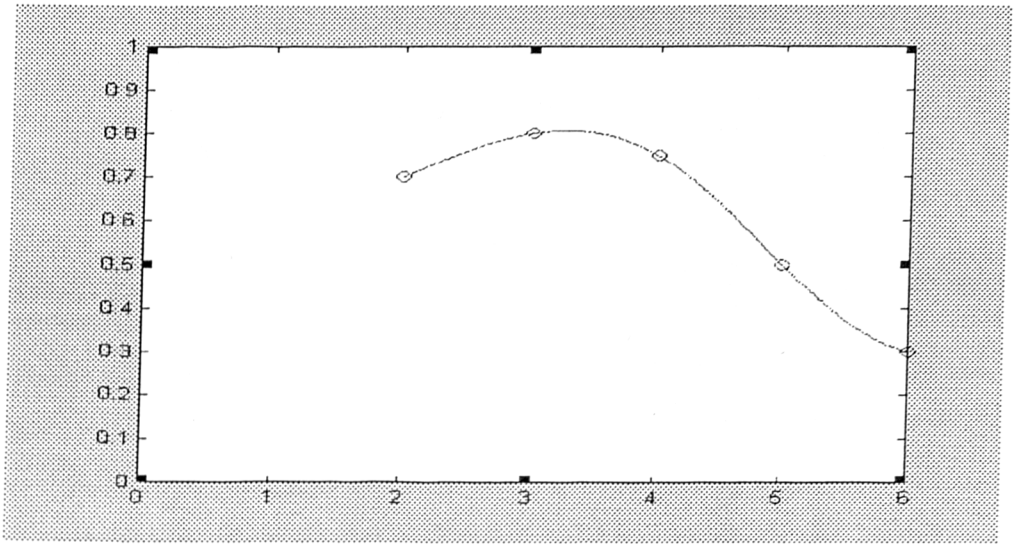


Table 5.15. Risk Uncertainty for Lusoponte

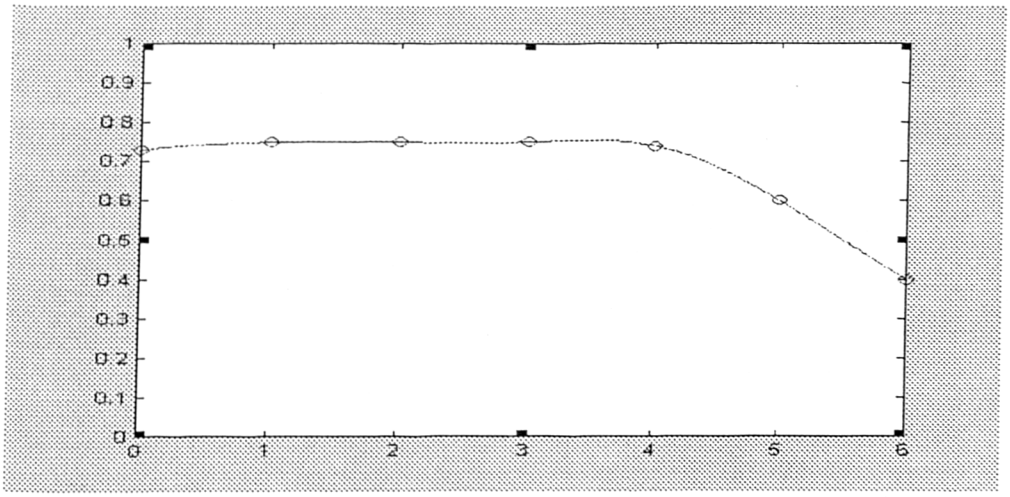
Social Uncertainty



area = 2.5667

```
x = 2:1:6;
y = [.7 .8 .75 .5 .3];
xitp = 2:0.01:6;
yitp = interp1(x,y,xitp,'spline');
plot(x,y,'o',xitp,yitp)
area = trapz(xitp,yitp)
```

Human Uncertainty



area = 4.1736

```
x = 0:1:6;
y = [.73 .75 .75 .75 .74 .6 .4];
xitp = 0:0.01:6;
yitp = interp1(x,y,xitp,'spline');
plot(x,y,'o',xitp,yitp)
area = trapz(xitp,yitp)
```

CHAPTER 6

Critical Success Factors in PFI projects

6.1 Introduction

This chapter discusses and proposes a model to achieve a successful PFI project. A successful organisation is generally defined as one that achieves its goals. Translating to a project it means that a successful project is the one that fulfils the project's goals unequivocally related to the project's effectiveness and efficiency. However, when Belout (1998) discussed the definitions of success/failure in a project he pointed out that this is a restricted traditional mechanistic approach originated mainly from the project manager's point of view excluding the views of other stakeholders. A definition of a successful project should measure success against *'the accommodation of all stakeholder' expectations'*, e.g., of the sponsor, project manager, users, etc. It is clear that this definition also comprises the criteria of the project's effectiveness and efficiency.

In the current research a successful PFI is hereafter considered as:

A successful PFI is a project that satisfies the needs and expectations of all the stakeholders involved

What determines success? Which are the factors that lead an organisation or project to success? These factors named as the Critical Success Factors were introduced in 1979 by Rockart and can be viewed as *'the critical competences within an organization'* whose existence or non-existence determines the organization's success or failure:

- *'The **limited** number of areas in which results, if they are satisfactory, will ensure successful competitive performance for the organization. They are the few key areas where things must go right for the business to flourish. If results in these areas are not adequate the organization's efforts for the period will be less than desired;*

- *Areas of activity that should receive constant and careful attention from management.'*

Within the same line of reasoning but more specific is another CSF definition proposed by Aaker (1992)

- *A Key Success Factor (KSF) is a competitive skill or asset that is needed to compete successfully. Successful firms are usually strong on several KSF and not weak in any.*

Brannback (1996) used CSFs thinking to force managers to become aware not only of the CSFs but also of the threats the organisations faces and decision opportunities it has. The importance of CSFs assessment lies in that once they are made explicit (Bullen & Rockart 1981) *'managerial priorities can be set more knowledgeably and resource allocation improved.'*

Within each economic sector there are different sets of CSFs at different levels: industry, organization, sub-organization and individual. The current research focused only on the assessment of 'industry' level CSFs, i.e., overall PFI market. As such, one purpose of the research was:

- *What are the CSFs for the 'PFI Industry'? or phrasing it differently*
- *What are the CSFs for the procurement model that PFI represents?*

6.2 Cognitive Mapping

The assessment of the PFI' CSFs used Cognitive Mapping as the analytical tool to analyse the qualitative data obtained in interviews to PFI's stakeholders. It is considered a 'neutral' tool, in that the ideas and structure developed express the representation of the PFI project.

Cognitive Mapping origins lie in the works of Tolman (Eden 1992) who wished to develop an alternative to the stimulus-response model of man. The original theoretical

developments go back to Kelly's Personal Construct Theory (Eden & Ackerman 1998). In this theory the fundamental proposition is that a person is continually trying to make sense of the surrounding world and develops the *'personal construct system'*, i.e., the understanding how individuals organize their environments requires that subjects themselves define the relevant dimensions of that environment. The personal construct system was represented by Repertory Grids that were the basis for the development of Cognitive Maps by Eden. Cognitive Mapping as a technique to map complexity is now widely acknowledged (Eden & Ackerman 1992).

> Cognitive mapping can be defined as (Eden & Ackerman 1998) *'a technique designed to capture the thinking of an individual about a particular issue or problem in a diagrammatic, rather than linear, format'*. Cognitive maps are the graphical representation of the individual thinking and perception of an issue. They reveal how issues relate to each other, the concepts an individual uses are represented as points and causal arrows represent causal links between these concepts. The causal relationships can take a positive sign that indicates *'may lead to'*, *'has implications for'*, *causes* or *'supports'* – moving up the arrow, or 'is supported by' when moving down the arrow, or negative signs that indicates the opposite. In the current study only considers the positive causal relations.

Cognitive mapping aids to structure the individual's underlying values and beliefs and discloses the relevant links between the concepts involved in a particular issue.

Cognitive mapping is an open procedure that starts with a blank page, the full meaning (Eden & Simpson 1989) of the ideas is given by the *'whole picture'* when the map is completed. The graphic form is an enormous advantage as it is relatively easy to visualize: first, how concepts and causal relationships relate to each other and second the overall causal relationships of one concept with another.

The works of Chaib-Draa (1998, 2002) include a detailed description of Cognitive Maps in the context of relational algebra and a formal model with precise semantics. This analysis is outside the scope of the current research but it illustrates that cognitive maps are not the ad-hoc descriptions of intuitive views but instead models described by formal mathematical treatments.

Cognitive mapping ensures that the manager's tacit knowledge is explicit, articulated and explored as managers have to explain and put into words issues, relations, consequences that are most often based on tradition, values, beliefs, experience and

faith. To ensure CSFs assessment validity it is critical that tacit knowledge is incorporated.

If several individual maps are merged into one, it ceases to be the representation of individual thinking and provides the aggregated view of a group. The aggregated cognitive map becomes the collective and combined view of all interviewees and a shared understanding of what is a PFI. It is a 'consensus cognitive map' of a PFI project representing all issues and their causal inter-relationships. It is then as desired, a holistic and systemic view of all the content and context (described by the links around the concepts) of all the issues involved in a PFI, as well as an accurate representation on how the relationships fit together in a hierarchical manner.

6.2.1 Comparison with other methodologies for CSFs identification

Cognitive Mapping is more suited to assess CSFs than similar techniques, like Mind Mapping and Concept Mapping, because these lack the causal relationships established among the issues. In addition, Mind Mapping starts with one central concept (issue) and all links depart from this central concept, which is clearly not the case in PFI where several issues can simultaneously influence (be central) to other issues.

Cognitive Mapping also has the advantage of reduced subjectivity when compared with surveys or checklists (Chan, Ho & Tam 2001, Wang et al. 1999; Chua, Kog & Loh 1999, Tiong, Yeo & McCarthy 1992). The subjectivity can derive from two different sources:

- Interviewees: both surveys and checklists are based in a scale (usually 5-Point Lickert, Very Low to Very High) where the relevancy is individually analysed based only in the interviewers heuristic perceptions, missing the explicit hierarchy behind the reasoning explicit in Cognitive Maps, 'this leads to'. With surveys the outcomes are lists. Different surveys, with different questions to different interviewees, in different contexts produce different lists, eventually with some overlapping CSFs. An alternative is to use a checklist approach and ask for the item's evaluation to a panel of experts (Ozdoganm & Birgonul 2000).

- Researcher: with Cognitive Maps there is no room for the researcher' subjective interpretations. The concepts and respective inter-relationships are all explicit. What the software does is merely to perform sequentially a set of analyses to identify the 'more important or key factors contributing to the desired goals'. The hypothesis being that these factors are the Critical Success Factors in a PFI.

Subjectivity in both surveys and checklists can also derive from the tools used to analyse the questionnaires. For example, surveys always require large samples and Factor Analysis is one of the most common analytical tools for dealing with a large number of items. This analysis logically groups the questionnaires' items into sets or factors. These factors that hypothetically represent the CSFs are not identified; what the analysis returns is merely Factor1, Factor2, etc., it is then necessary to make a subjective interpretation and qualify each factor to identify the CSFs.

Previous studies (Bana e Costa et al.1999) also used Cognitive maps to determine CSFs, but it was in a different context and their approach was not fully Inductive, introducing some subjectivity. Experts proposed the CSFs (similar to factor analysis) basing their choice in the Cognitive Map analysis: 'explanations', 'consequences' and 'clusters'.

Finally, surveys and checklists are very limited in exploring the contexts in which the CSFs are identified. Belassi and Tukel (1996) emphasized the importance of the inter-relationships among success factors although using a different approach from the current research. He first identified the group a CSF belongs to, and then determined the combined effects of this factor, while the current research adopted the opposite approach, i.e., first identify the issues and respective inter-relationships and from that context derive the CSFs.

6.3 Methodology for CSF Identification in a PFI

The methodological approach to identify the CSFs avoids subjective interpretations and combines the perceptions of actual PFI' stakeholders and is based on the PFI' operational issues. It is Inductive rather than Deductive where conclusions are drawn from general principles assumed to be true.

The fundamental assumption in the current research is that **'the CSFs are within the most relevant issues of a PFI those that simultaneously influence and contribute to more than one PFI goal'**. The logic being to select those issues that exert more influence throughout the entire project and that have a *positive* contribution to the achievement of goals. Why more than one goal? Because by definition the CSFs are limited in number and if all relevant issues are considered, a very large number of factors would be obtained, which is against the essence of CSF. If more than four or five factors are considered critical, the organizations disperse its efforts with questionable results as to the improvements that the focus on CSFs convey

As the cognitive map describes in its entirety the project's several stages it takes into account that:

- PFI requires a broad range of competences to inter-relate closely for a common purpose - very often for the first time ever;
- PFI involves many stakeholders over the long-term (20-30 years) whole life cycle context.

To obtain the best possible PFI' holistic[1] and systemic[2] description the cognitive map included data from all the developed PFI case studies and the opinions of experts from several sectors in different functions – financial, operation and management, etc. The cognitive map was built by sequentially incorporating the information given in successive interviews to a representative group of PFI stakeholders that checked and validated the map. During the interviews the researcher exerted some judgment and asked for a re-evaluation of some relations. As interviews progressed new concepts or issues were added reflecting each person's perception of their own field of expertise, for example, finance managers would naturally concentrate in financial issues, operations

[1] *Holistic* - that conceptualises the reality as an undivided whole.
[2] *Systemic* – complete.

and management managers on operational issues. Project managers were also interviewed and were key to provide the holistic perspective. With this methodology the map is validated, as it would be not feasible to repeat the interviews or get together all interviewees.

The approach of intentionally not asking for the interviewee opinion on CSFs also avoids interviewee bias, as many managers may not fully grasp what the research considers to be a CSFs (or have a different one from the one that we consider) and also because they tend to over (under) estimate, as in surveys and checklists, the CSFs related to their own area of expertise. In addition, it avoids preconceptions based on existing literature.

In short, Cognitive Maps analysis eliminates some limitations of other methodologies because:

- There is no subjective interpretation of factors, i.e., the concepts, and respective inter-relationships displayed in the map are not the product of the researcher' interpretation;
- The maps analyse context, i.e., how issues inter-relate hierarchically. The importance and relevance of the issues are connected to the PFI' goals, in the assumption that there is a hierarchy of the type: One leads to the other and so on.
- It is open, and not affected by previous analysis or preconceptions.

Decision Explorer (1997-2001)[3] was the software tool used to analyse PFI Aggregate Cognitive Map. It is a database of relationships that permits both the building and analysis (explore) of the map. The methodology developed to assess the CSFs ensures the results' validity, and was adapted from the Tutorial presented by Ackerman (2001). The methodology's sequence (Figure 6.1) is to: First determine the Goals of a PFI, second in a separate analysis find the most important issues (the ones that exert more influence) and finally combine the results of the two previous analyses and determine which of the most important issues contribute to more than one Goal.

[3] Decision Explorer © 1997-2001 Banxia® Software Ltd. All rights reserved.

The detailed procedure is:

1. To find the best possible description of a PFI project putting together an aggregate or consensus cognitive map, where the operational issues (concepts) and their respective context (inter-relationships) are represented (sec. 6.3.1). The map was verified and validated throughout successive interviews. Before proceeding with the analysis the map must be cleaned of concepts that are not linked, thus with no interest to the analysis (orphan concepts) and of the loops that indicate biased reasoning (sec. 6.3.2);
2. The CSFs are considered to be the most relevant issues (Relevant issues Identification (sec. 6.3.4)) that influence and contribute (Hierarchical Analysis of Goals (sec. 6.3.5)) to more than one PFI goal (Goals Identification (sec. 6.3.3);
3. The CSFs identified (sec. 6.3.6) and directly obtained from the analysis are named Operational CSFs' because only the operational issues are represented in the map not the underlying theoretical generalisations (Figure 6.1). Further conceptualisation is needed to determine the model for the PFI' CSFs;
4. The CSFs are critically considered checking internal consistency and evaluating the critical validity recurring to the empiric knowledge and insight gained during all the research, including the available bibliographic information. If any CSF (or the operational issues that it supports) has an opposing causal relationship with other CSF, then there is a conflict. As it is impossible to have simultaneously two conflicting CSFs, it is then necessary to review the cognitive map;
5. The next step is the evaluation of external consistency to ascertain as to their criticality and validity;
6. The final step is the development of the CSFs Model. A critical analysis of the results and literature review was made, followed by careful consideration, interpretation, judgement and conceptualisation to find the underlying theoretical generalisations of each Operational CSF or the 'Real' CSFs.

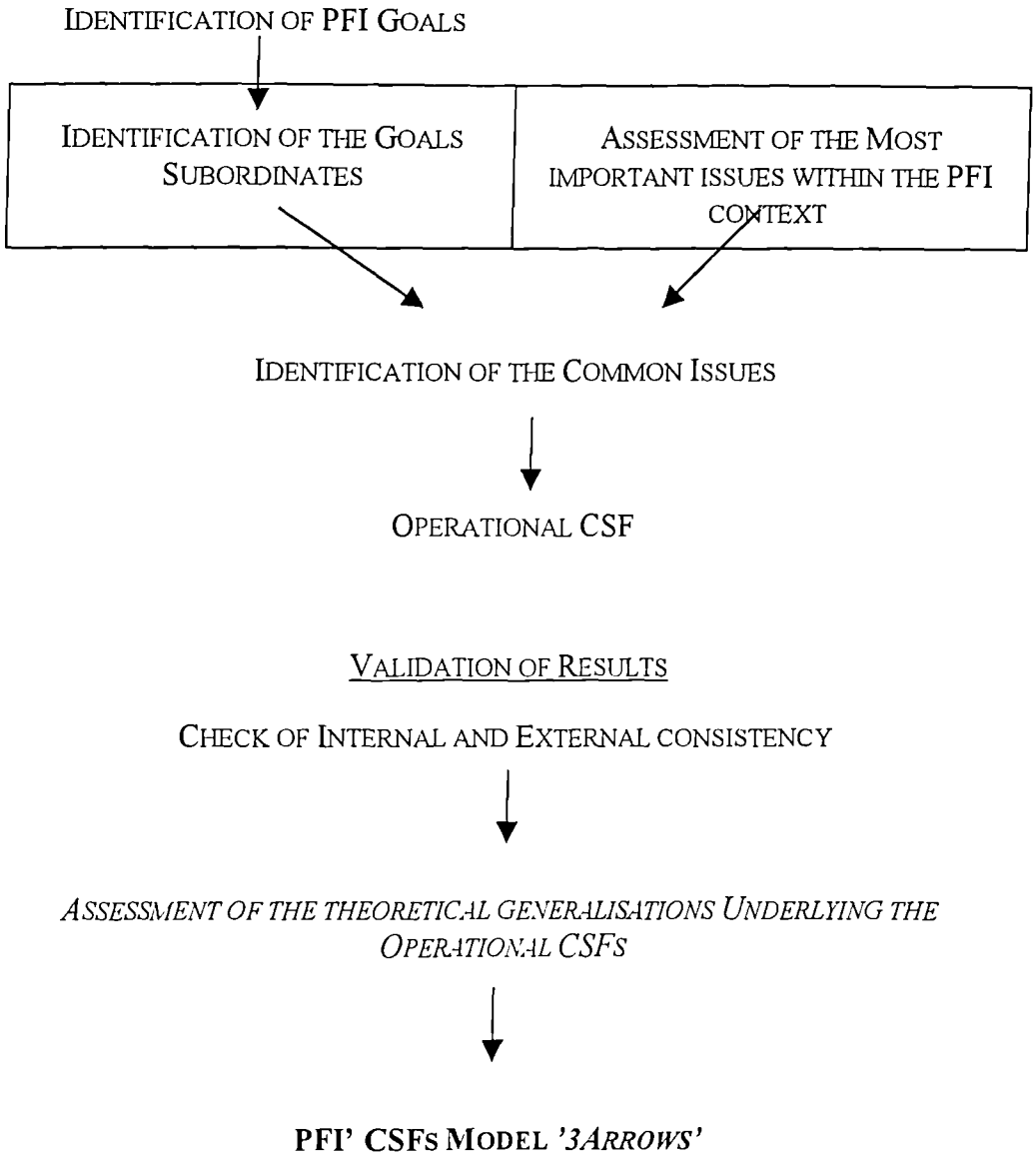


Figure 6.1. Methodology for CSF Assessment

The following sections present a detailed description and rationale of all steps.

6.3.1 Development of the PFI Aggregate Cognitive Map

The cognitive map that represents a PFI project is illustrated in Figure 6.2. The map has 40 operational issues (concepts) and 79 causal links (Table 6.1).

Table 6.1. Operational Issues included in the PFI Aggregate Cognitive Map

Adequate Financing Package	Empowerment of Public project team	Operating/maintenance costs controlled
Adequate Regulative framework	Established Political Will	Perception of Reduced Risk
Adequate return	Experience in previous tender/sector	PI Training
Adequate Service output (quality-convenience)	Good personal interrelationships	Political/Social risk controlled
Commitment to common goal	Good preparation of proposal	Reduce ambiguity
Consistency of strategies-common goal	Good project leader	Satisfied clients
Control of Obsolescence risk	Good Project Management	Scheduling Bidding ... undefined negotiation period
Correct estimate of concession's length	Improves Confidence between parties	Service clearly defined
Correct market evaluation	Integrate knowledge from current O/M	Short negotiation period
Correct price of Service	Investment according to estimates	Stable O/M Team
Correct risk allocation	Low biding cost	Standardisation Bidding & Negotiation procedures
Correct risk evaluation	Market according (or better) than estimated	Standardisation of O/M procedures
Correct Risk Identification		Team Stability
Developed financial markets		Win tender

6.3.2 Tidying the Map – Identification of Orphan Concepts and Loop Analysis

The concepts that are not linked - orphan concepts – are of questionable interest in a map whose central significance are the relationships established between the concepts. The existence of loops may, or may not, indicate biased reasoning, so careful consideration must be given to the decision on maintaining them as they are, or, if it is necessary to review the relationships within the loop and eventually eliminate the loop. An analysis after the decision to maintain the loop is suggested by Chaib-Draa (2002) that used causal maps as a tool to represent the dynamic holistic approach of an organization. He stated that *organizational dynamic aspects and influences evolve through paths that close on themselves and form loops*. The loops are important for two main reasons:

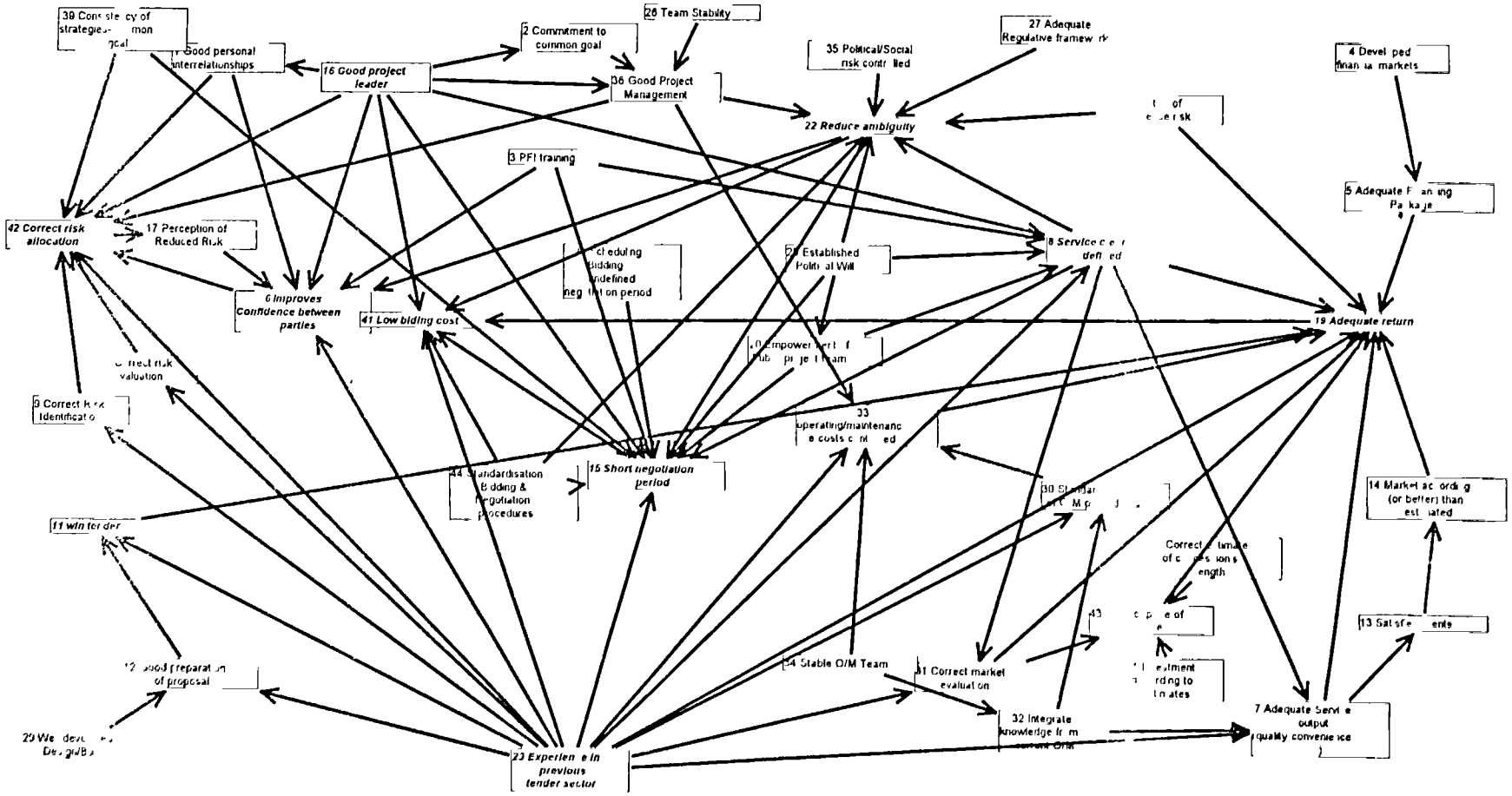


Figure 6.2. PFI Aggregate Cognitive Map.

- A change positive (negative) in an organization is the result of *deviation-amplifying* loops, i.e., series of successive positive (negative) causal relations;
- The stability of an organization is the result of *deviation-countering* loops, i.e., positive causal (leads to) followed by a negative causal (doesn't lead to).

The first step is then to tidy up the map checking for the existence of orphan concepts and loops. No orphan concepts were found, but one loop was identified (Figure 6.3) of three concepts: Improves confidence between parties, Correct Risk Allocation and Perception of Reduced risk. After consideration of the rationale that originated the loop it was decided to maintain it, since the underlying reasoning indicates a logical iterative process not a biased reasoning. Indeed it is reasonable to suppose that a correct risk allocation will cause a perception of reduced risk, which in turn will improve the level of confidence which in turn leads to a better risk allocation.

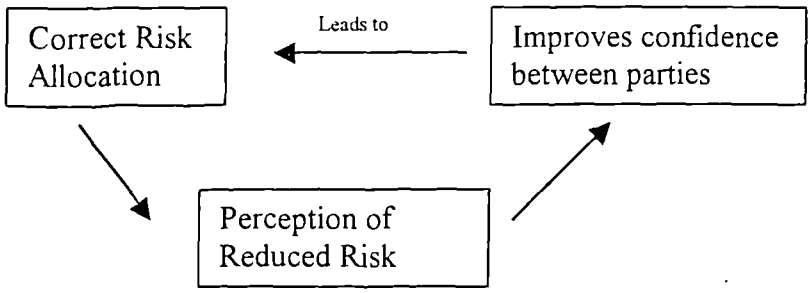


Figure 6.3 Loop in the PFI aggregate cognitive map

According to Chaib-Draa (2002) it is a **deviation-amplifying loop**. It indicates that one positive transformation (or negative) of the PFI can be the result of an initial increase (decrease) in confidence between parties that increases (decreases) the perception of correct risk allocation which in turn increases (decreases) the perception of reduced risk. Finally, and to close the loop, the increase (decrease) in perception of reduced risk increases (decreases) confidence between parties.

6.3.3 Identification of PFI Goals

The cognitive map is based on a hierarchy, where the 'layers' of ideas move from the top where are the aspirations or 'goals' to achieve, to the bottom layers that represent the causes or what leads to the desired goals (Brightman 2000). The logic behind the hierarchy is that people talk about issues with a view to make a situation better or 'less bad'. In Decision Explorer, the goals are identified as the 'Head' concepts, which are the outcomes at the 'top' of lines of argument.

Three goals in a PFI were identified, critically analysed and validated based on the empiric knowledge and insight gained. **Low Bidding Cost, Win the Tender and Adequate Return.**

It is interesting that each goal refers to the widely acknowledged three most important landmarks in a PFI: the tender stage where it is very important to keep costs down; the signing of the contract – without it there wouldn't exist a PFI, and finally the operation stage where the investors get return on their investment.

- **Low Bidding Cost** it is essential for all parties to keep the bidding costs as low as possible. Both the public and private partners have to avoid unnecessary costs, and don't incur excessive (and needless) expenses. The private companies have to bear in mind that if they don't win the tender the money spent preparing it is a total loss.[4]
- **Win the tender** clearly is a goal for the private partner.
- **Adequate return is the essence of a PFI.** The private sector has to recover its investment which is only possible it if the project generates sufficient revenues. It is also important to the public partner as it is an indication that the project is performing well with an adequate service output, thus achieving the ultimate objective of the government which is the provision of a well performing service.

[4] The UK government is considering the hypothesis of financial compensation in some instances for unsuccessful bidders, to avoid that private companies with less financial strength can be damaged or that others seek compensation reflecting these losses in future tenders.

6.3.4 Identification of the Most Relevant Issues in a PFI

Decision Explorer can identify the most relevant issues in a cognitive map by combining the results of two separate analyses: Domain Analysis which gives an indication of the complexity of the linking around the concepts, and Central Analysis which gives an indication of the influence of the concepts in the context of the map. The rationale (Banxia 1998-99) behind Domain Analysis is that people tend to talk a lot about what they perceive as relevant issues, and consequently the concepts that appear in the map and that characterise these 'relevant issues' will be highly elaborated (a lot of concepts linking in and out) Highly elaborated concepts will have a high domain score. Central Analysis is complementary to Domain Analysis. It looks beyond the immediate environment (links) around a concept and examines the complexity of links at a number of levels away from the concept. The higher the score the more influence the concept has within the model as a whole.

The highest scoring central concept may not be at the top of the domain analysis results, and vice-versa. That is why a genuine key issue must combine a high score in both, Domain and Central analysis, i.e., exerting simultaneously influence in the immediate and remote environment throughout the model.

The results of Domain and Central Analysis of the PFI Cognitive Map are listed in Table 6.2.

Table 6.2. Domain and Central Analysis

Domain analysis Operational Issues with *equal or more than six links directly* around them	**Central analysis** Operational Issues with *equal or more than twenty links* in the network around them
1. Experience in previous tender/sector – 14 links around 2. Short negotiation period – 11 links around 3. Service clearly defined – 14 links around 4. Reduce ambiguity – 10 links around 5 Correct risk allocation – 9 links around 6. *Adequate return – 9 links around* 7. Good project leader – 8 links around 8. Improves Confidence between parties – 7 links around 9. Good Project Management – 6 links around	1. Experience in previous tender/sector – 25 links from 39 concepts 2. Service clearly defined - 23 links from 39 concepts 3. *Adequate return - 22 links from 39 concepts* 4 Short negotiation period - 21 links from 36 concepts 5 Reduce ambiguity - 20 links from 36 concepts 6. Correct risk allocation - 20 links from 36 concepts 7. Good project leader - 20 links from 36 concepts 8. Improves Confidence between parties - 20 links from 36 concepts

'Adequate Return' previously identified as a Goal, and 'Good Project Management' which was not common to both sets, were removed. As such, the most important issues that are simultaneously more elaborate and exert more influence within PFI (common to both Domain and Central Analysis) are included in Table 6.3.

Table 6.3. The most Important Issues in a PFI

Correct risk allocation
Experience in previous tender/sector
Good project leader
Improves Confidence between parties
Reduce ambiguity
Service clearly defined.
Short negotiation period

The next step is a hierarchical analysis that will permit the identification of the Operational CSFs, i.e., most relevant issues that contribute positively to the desired Goals.

6.3.5 Hierarchical Analysis of Goals and Identification of the CSFs in a PFI

The Goals' hierarchical analysis looks at each goal individually and identifies the concepts that support them (the concept's subordinates), or the respective *Group of Teardrops*. Each teardrop contains every concept that leads to it. Not to overburden the figures, the *Hierarchical Set*, or *Hieset*, for all the Goals presented in figures 6.4 to 6.6, includes only the links that are directly connected to them, otherwise it would be too complex.

The hierarchical set for the Goal 'Low Biding Cost' is illustrated in Figure 6.4. Not surprisingly, 'Short Negotiation Period' has a significant importance in reducing 'Bidding Cost'. The same occurs with 'Standardisation of Procedures'.

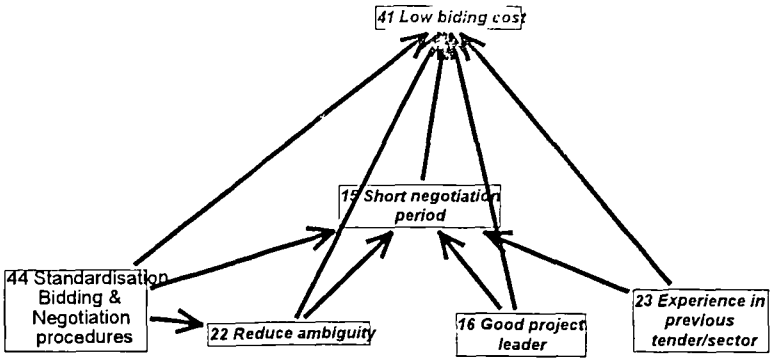


Figure 6.4. The subordinates of (or that support) the concept Low Bidding Cost

The hierarchical set for the Goal 'Win Tender' is illustrated in Figure 6.5. 'Good Preparation of the Proposal' and 'Experience in Previous Tender/Sector' are the two most important issues that lead to 'Winning the Tender'.

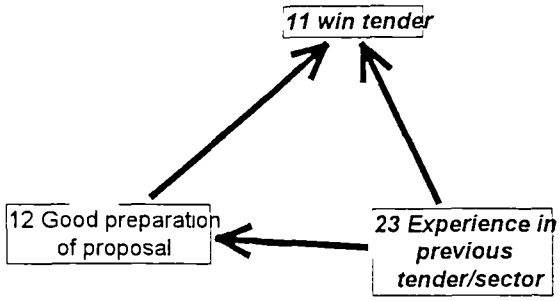


Figure 6.5. The subordinates of (or that support) the concept Win Tender

The hierarchical set for the Goal 'Adequate Return' is illustrated in Figure 6.6. In order to get an 'Adequate Return' a significantly higher number of factors are involved as could be expected. The issues range from 'Correct Price for the Service' to 'Adequate Financing Package'.

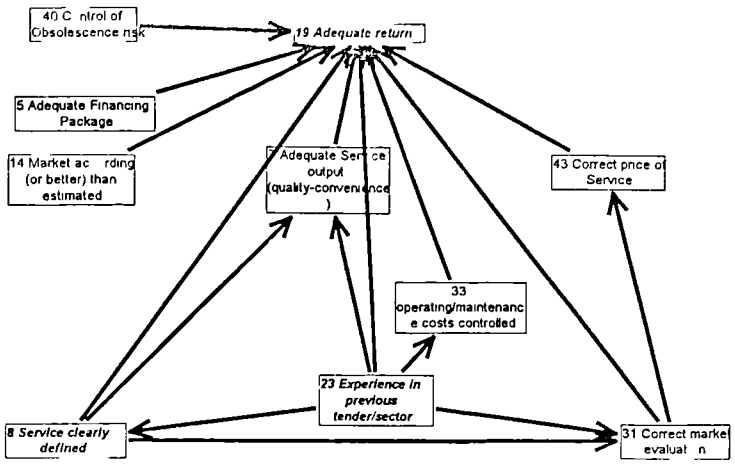


Figure 6.6. The subordinates of (or that support) the concept Adequate Return.

Having identified the issues that support each PFI goal, the next step is, according to the proposed methodology, the identification of the concepts common to different *hiesets*, i.e., those that contribute positively to more than one Goal.

6.3.6 Identification of the Operational CSFs

Potent Analysis in Decision Explorer, identifies the concepts common to several hiesets. When comparing the results of the Table 6.4 and of Figures 6.4 to 6.6, some of the operational issues included in table are not visible in the figures because, as mentioned, for simplicity each representation of the hiesets only includes the first layer of concepts.

Table 6.4. Potent Analysis

Operational Issues common to 3 Goals Hiesets	Operational Issues common to 2 Goals Hiesets
Experience in previous tender/sector *	**Good project leader** * Commitment to common goal **Service clearly definec** * Established Political Will Good Project Management PFI training Control of Obsolescence risk Empowerment of Public project team

*Identified as one of the most important operational issues in a PFI (Table 6.3.).

It is now possible to identify the operational issues that comply simultaneously with the two criteria to classify as Operational CSFs: most important in terms of complexity around them and that have more influence in the whole context of a PFI (Table 6.3); and that contribute to more than one goal (Table 6.4).

The PFI operational issues that satisfy the two criteria and that can be classified as the Operational CSFs are:

- **Experience in previous tender/sector** – contributing to three goals;
- **Good project leader** – contributing to two goals;
- **Service clearly defined** – contributing to two goals.

The next step is the validation of the Operational CSFs assessing their internal and external consistency. Looking first at internal consistency, it seems that they are closely inter-related and logically bound – a 'Good Project Leader', with 'Experience' leads to a 'Better Service Definition'. A good example of the interrelation of the three factors is found in the area of custodial services, where the correct definition for the service has led in early PFIs to extensive discussions before contract signing. Now with the experience gained, in a sector that traditionally has good leadership the service is clearly defined and is widely recognised that it is a sector where PFI performs well. In conclusion, the three Operational CSFs present a high degree of internal consistency.

As to external consistency the Operational CSFs are consistent with the empiric and heuristic knowledge found in PFI and project finance areas within the research

undertaken. The Operational CSFs are consistent with the ones found in the literature for projects of this nature (Chan, Ho & Tam 2001, Wang et al. 1999, Chua, Kog & Loh 1999, Tiong, Yeo & McCarthy 1992). Experience in the PFI methodology is specially valued and implicitly acknowledged by the UK government that has already recognised the imperious need of recruiting the best available people to deal with PFI projects in public sector teams. Leadership is also seen as critical in the early stages '*The Authority should ... appoint a (PFI) contract manager, with clear objectives, well before the contract enters into force ...the contract manager will need to fully understand the business* ' (HM Treasury Taskforce 2000).

In conclusion there is internal and external consistency and therefore the Operational CSFs (Table 6.5) are validated.

Table 6.5. Operational CSFs

Experience in previous tender/sector
Good project leader
Service clearly defined

6.4 The CSFs Model

In the previous sections, the three CSFs represent the operational issues that are key for success in a PFI: **Experience in Previous Tender/Sector**, **Good Project Leader** and **Service Clearly Defined**. These CSFs are operational as they are drawn from the PFI cognitive map where only the PFI operational issues are represented. To pursue the objectives of the research, and find the theoretical generalisations underpinning the operational CSFs, it is necessary to draw the theory-based implications of these results and propose a model for the CSFs in PFI projects.

It is necessary now to conceptualise and propose the (subjective) theoretical model that underlies these Operational CSFs. After careful consideration is proposed that:

- **Clear Strategy** should be the underlying theoretical concept for Service Clearly Defined;

- **Effective Leadership** should be the underlying theoretical concept for Good Project Leader;
- **Knowledge Management** should be the underlying theoretical concept for Experience in previous tender/sector.

A detailed discussion follows on the reasoning and justification for the choices done. The main objective of the discussion is to answer *'why'* these factors were considered the underlying theoretic concepts of the operational CSFs in a PFI.

6.4.1 Strategy as the Underlying Theoretical Concept for Service Clearly Defined

'A well-defined strategy is the basis of a successful PFI' (KPMG Management Consulting 1998)'.

This statement emphasizes the importance of strategy definition.

The Service Clearly Defined is an operational issue, but it is also a clear strategic objective. Strategy in military terms is always defined as 'where the battle is going to be fought'; tactics is how you get there. In business terms it means to determine in which market, or market segment, the company is going to operate. A clearly defined strategy means that there is an accurate definition of the clients' market segment and of the objectives to pursue the answers to the questions:

- Who are your clients/market?
- What is the client's need / which service do they want?
- What are the client's choice criteria?

As such th definition of strategy permits to define correctly the operational objectives on how to reach the clients/market. A company has to know well what it is selling, in order to sell it well. The Service in a PFI is no different from the product/service that companies supply to their customers. It aims at a specific market determined by the

Government[5]. It is its responsibility to accurately define the strategy, i.e., the market for the PFI - which service and which clients it is going to serve. The government does this when it evaluates 'Business Need'. In the case of PFI it defines the clients and their need, which is the service provided. If strategy is clearly defined, service definition derives naturally

The correct strategy is vital to the project's revenue as it conditions the Level of Usage, i.e., how many clients will use your services. If the level of usage is overestimated (less clients than estimated) there will be less revenue and a deficit in the PFI revenue is likely to occur. Before the contract signing lengthy discussions always occur if the objectives are unclear or undefined.

As such, a clear strategy seems to be unequivocally the underlying theoretical concept for Service Clearly Defined.

A very important issue is the need for *'strategic consistency'*. This need is applicable to all stakeholders and also internally within the companies that participate in a PFI. For example, a constructor that participates simultaneously in other projects must ensure that there exists strategic consistency or coherence between the PFI's strategy and the other project's strategies, i.e., all projects must make sense within the company. Strategy is at the bottom level of the pyramid that has Vision and Mission as the two top levels. Before the PFI, both the Authority and Concessionaire had different Visions, Missions and Strategies. A PFI project developed by these entities cannot be a separate entity with a distinct Strategy. Instead, all the stakeholders' strategies and that of the PFI must be aligned. The sharing of common Visions, Missions and Strategies implies the sharing of common Strategic Objectives, which are the vehicles for an understanding of the PFI and better resolution of the problems that may arise.

The Government also needs to display consistent strategies. For example, the UK Government publicly declares its commitment to contain urban sprawl, revitalising inner-city areas, which means promoting projects in brownfield sites, which is contradictory with the development of PFI because most PFI projects are in greenfield sites necessarily less costly to build-on. The opposing strategic approaches that the UK Government demonstrates only introduces confusion, and if a PFI service definition is in question it will be more difficult to define.

[5] In a PFI the ultimate responsibility for the Service provision lies always with the Government. The Government just delegates it temporarily to a private concessionaire, and retains throughout the PFI whole life cycle the right to step-in, in the presence of possible environmental, health and safety hazards.

6.4.2 Leadership as the Underlying Theoretical Concept for Good Project Leader

Leadership is, according to Donnelly, Gibson and Ivancevich (2000) '*the ability to persuade people to pursue with enthusiasm pre-established objectives. It is the human factor that bonds the group and motivates it to achieve the objectives. Management activities such as planning, organizing and taking decisions are like sleeping embryos that the leader awakens through motivation and guidance to pursue the objectives*'.

Leadership is not only the ability to meet performance goals but it needs to meet all the challenges that an organization (or project) faces, including (Jones, George & Hill, 2000) '*the need to obtain a competitive advantage, the need to foster ethical behaviour and the need to manage a diverse workforce fairly and equitably*'. In complex projects like PFI a strong leadership ensures that not only the operational objectives are met, but also very importantly that a good network of personal relationships is established fostering the climate of trust and confidence between parties, thus reducing the perception of risk and uncertainty that is always present in these projects.

Leadership is essentially a process through which someone influences others through commonly shared vision. To be effective it cannot be based in force or coercion. When leadership is exerted effectively the participants are motivated, committed and performing. This is very important for the success of a PFI, as these types of projects are very dependent on the ability to raise efficient and innovative solutions. The needed creativity is essentially fostered by motivation, which in turn is highly dependent of effective leadership.

A good practical example of the importance of effective leadership is the existence among the insurance package offered to PFI sponsors, of an item named 'Insurance of Key Man Loss'. This illustrates unequivocally the importance of good leadership in a PFI project.

According to what was discussed and using some judgement it seems clear that the theoretical concept underlying the need for a good project leader is leadership.

6.4.3 Knowledge Management as the Underlying Theoretical Concept for Experience

> *'In an economy where only certainty is uncertainty, the one sure source of lasting competitive advantage is knowledge'* (Nonaka 1991 p.96 quoted in Brannback 1996, p.71).

Knowledge Management (KM) is a process through which it is possible to turn human intellectual capital into organisational capital (KPMG 1998). KM ensures that not only structured data included in databases are transmitted throughout the organisation, but also that unstructured data - like experiences and heuristics - are also transmitted to the organisation and fed into new projects. It aims to understand the value of intellectual assets, fostering collaboration and knowledge sharing, re-using existing know-how and expertise, and therefore improving decision-making.

What is new about attitudes to knowledge today is the recognition of the need to manage knowledge and include it and use it as a company asset. It is a challenging task, as it requires a profound shift in the prevailing organisational culture where you are rewarded by what you know not for what you share. As such, KM requires a combination of disciplines from Human Resources to IT that provides the mechanisms to capture store and retrieve the corporate (or organisational) raw data that forms the basis of knowledge (Financial Times 1999).

There is also ample empirical evidence on the importance of KM in risk management. Spreading knowledge throughout an organisation naturally raises the organisation's overall level of knowledge, and (Peters 1999) increasing knowledge may decrease ambiguity and thereby reduce uncertainty. Turner in Stewart (1995) also linked organizational learning with the management of risk, and identified three mechanisms by which organizational learning may be achieved: by direct experience, by interpreted experience and by the development of collective understandings. All mechanisms are forms of KM integration. In addition, Dawson (1997) referred to this need of knowledge integration proposing a hierarchical model for RM where the company's risk management model comprises all the company's projects.

According to these definitions it seems valid to propose that KM is the underlying theoretical concept for Experience.

Another Soft systems analysis has been used in risk management in projects (Stewart & Fortune 1995). It is also a holistic technique and deals *'with hard tangible information and also with the soft complexity that arises because people are involved'*. It concluded that an emphasis on the systemic should begin when a project is first conceived and continue until the final lessons have been learnt after completion.

In long-term projects with life cycles spanning through 20 to 30 years, KM becomes naturally a Key Factor for Success. Key personnel will depart before the end of the project, and it is vital to have some structured system to keep their knowledge and expertise within the project's organisation.

The next section presents the conceptualised data induced model for CSFs in a PFI.

6.5 The '3Arrows' – The PFI CSFs Model

The proposed model for the CSFs in a PFI project was named **'3Arrows'** because it is simple and accurately describes the model's graphical representation (Figure 6.7). The rationale behind the representation is the following: Each of the three CSFs is represented by one arrow: **Clear Strategy, Effective Leadership Knowledge Management**. As the CSFs are closely inter-related the arrows interact with each other in a continuous and iterative process. The reasoning is that in order to have an effective leadership, clear strategic objectives have to be established, all stakeholders need to share a common vision, and also knowledge (from previous and current experiences) has to be incorporated in the whole process. It demonstrates that without the previous establishment of the strategy it is not possible to have effective leadership and vice-versa.

Figure 6.7. '3Arrows' - Model for the Critical Success Factors for a PFI project.

In conclusion, the methodology proposed for the assessment of the CSFs in a PFI is based in the systemic and holistic context, and on the hierarchy and respective inter-relationships that have been identified in PFI projects. It differs from the usual ways of identifying the CSFs as it recognizes the complexity that these projects convey. The advantages versus the traditional survey or checklist-based methods are that: first, there is no subjective interpretation of factors; second the maps analyse context, i.e., how issues inter-relate hierarchically; and third it is open, and not affected by previous analysis.

Based on the analysis of the empiric data collected a conceptual model is proposed that integrates the three CSFs for a PFI project: Clear Strategy, Effective Leadership and Knowledge Management. It accounts for the need of clear objectives, of good project leaders both from the public and private sector and very importantly of KM systems, i.e., the need to keep structured all information and expertise within the organisation until the end of the project's life cycle.

The next chapter summarises and proposes a framework for the sustainability of the PFI's Competitive Advantage. As discussed in Chapter 3, for PFI to develop as a procurement model requires a favourable political and economic environment, but each individual project also needs to comply adequately with Risk Uncertainty (Chapter 5) and focus on the CFS (Chapter 6).

CHAPTER 7

Sustainable Competitive Advantage of PFI

7.1 Introduction

This chapter evaluates the PFI's competitive advantage, a key issue for the future of PFI. *'Competitive Advantage' is the ability of a company to outperform the other competitors within the same industry.* (Jones, George & Hill 2000) To achieve this competitive advantage the company has to produce the goods or services more efficiently and effectively than its competitors, which is translated financially by a profit rate higher than the average for the industry.

A PFI is always defined as a project but it can also be regarded as a company with a predefined life span. The PFI's legally and functionally acts like a regular company whose sole objective is the project's completion. It is then possible to apply the theories of competitive advantage that were developed for regular companies. The following is a brief explanation of the model adopted to assess the PFI's competitive advantage: The **4 Building Blocks of Competitive Advantage**.

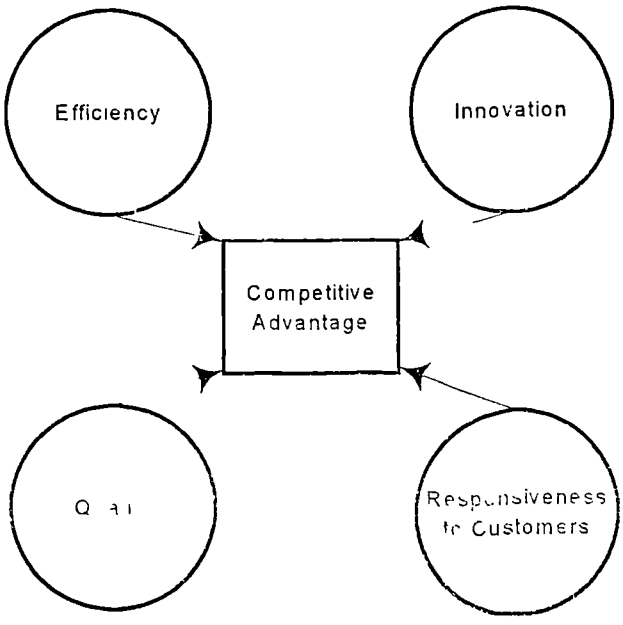


Figure 7.1. The '4Blocks' of Competitive Advantage

According to Jones, George and Hill (2000) the four building blocks of competitive advantage are: **Innovation, Quality, Efficiency and Responsiveness to Customers** (Figure 7.1). Each of these blocks is dynamic, i.e., it is understood that it is necessary to continuously improve each block to obtain and maintain the competitive advantage. The main concern was to try to answer the questions: How is it tested? How is it measured? And How is it evaluated? The issues in a PFI to which these questions apply are numerous and a standard metric for the improvements is in itself a broad area outside the scope of this research. The establishment of benchmarks and milestones to assess these factors is undoubtly an important area for future research work. In this research the questions were open and the interviewees would comment on the area of their expertise. The result is a set of areas, and issues where improvement was identified by comparison with the pre-PFI *status quo*.

Increasing Innovation - Innovation is a process where new goods or processes are developed under incentive, it derives from an intellectual effort that is only done under pressure. Incentive is needed as human nature tends to be conservative. If something has worked out why change it? You don't touch a winning team (paradigm). Innovation requires the creation of a work environment that encourages risk taking.

It is interesting to note that PFI was in itself an innovative product relative to the traditional ways of procurement, but can PFI induce innovation? In PFI there is always a strong incentive for the private sector to innovate and get a better return on investment by reducing costs and/or increasing revenues.

Increasing Quality – The existence of Quality in a process means that there is the right adjustment between process and output, or between what is offered and the needs. It aims at getting the right service (product) to the customers reducing losses or unnecessary high standards. It is not subjective. Operational and measurable parameters have to be stated a priori to enable the understanding of what is meant by quality, and most important, to measure and control the quality. Good quality products 'Do the job they are designed for, do it well and give customers what they want' (Jones, George & Hill 2000). The best known managerial technique to improve quality is TQM that focuses on improving the quality of a company's products and services and stresses that all the organization's functional activities should be directed to this goal, for example Lean Construction philosophy aims at improving quality in the construction industry. Another reason to improve quality is that higher quality is closely related to improved efficiency and better VFM.

Increasing Efficiency – Efficiency is key in today's competitive environment. It aims at reducing the resources needed to produce a specific output, or conversely, with the available resources increase the output. Efficiency gains can be obtained either recurring to new technologies and/or to new ways to manage the procedures/organisations.

Improving Customer Responsiveness (or Attention to the Client) – It is about giving to customers what they want and need and promoting the organisational strategies that respond to those needs. It is important to correctly identify the client's needs, recognising that very often customers have unperceived needs. It is a marketing job to make the clients aware of their unperceived need develop the need and persuade the clients to buy the product. Very often what customers desire is value for money, that is, to have the notion that they have correctly 'invested' their money. As VFM is closely related to good quality low cost product (efficiently produced) it is clear that all the building blocks of competitive advantage are closely inter-related.

All of the'4Blocks' of Competitive Advantage are not mutually exclusive. Indeed they are closely inter-related. For example, improving the efficiency of a process has clear implications on innovation and quality.

Having achieved a competitive advantage the next step is to keep it. The key issue for a company or PFI in the current dynamic environment is the ***Sustainable*** **Competitive Advantage**. It is necessary to never stop improving the four blocks of Competitive Advantage. The main pitfalls to avoid depend on the existing Imitation Barriers, the Capacity of Adjustment to Change and the Industries' Dynamics:

- The raising of Imitation Barriers depends upon which factor the competitive advantage is based. It can be on tangible or intangible factors. The tangible factors are the easiest to imitate since they are largely based on technology, so it is important to focus on intangible assets like know-how, procedures, etc, that are more difficult to imitate.
- The two major factors that hinder the Capacity of Adjustment to Change are: Inertia and the Icarus Paradox. Inertia is very easily installed in an organisation that is doing well, but it is very important to resist it and instead to adopt a more proactive attitude, as competitors are always improving. The

Icarus Paradox occurs when a company becomes focused on one particular factor of competitive advantage at the expense of other equally important factors.

- The Industries Dynamics depends on the particular industry, but the surrounding environment is constantly changing and that also has to be accounted for. A continuous attention to the environment and a strong focus on innovation are key to maintain a Sustainable Competitive Advantage.

The following are examples drawn from the empiric data collected for the purpose of supporting the conclusions on the PFI' Competitive Advantage and its Sustainability

7.2 Empiric Study

The data to assess PFI's Competitive Advantage was collected during the fieldwork undertaken for the PFI case studies: Lusoponte (Annex II) the PFI to build and operate two bridges in Lisbon, Portugal, the Victoria Dock Primary School (Annex III) in Hull UK a PFI to build and operate a primary school, a similar PFI from the JSCSC (Annex IV) in Watchfield UK, Indáqua Feira (Annex V) the water and wastewater systems construction and operation in Santa Maria da Feira in Portugal and the Manchester Fire Station (Annex VI). Some evidence was also drawn from interviews with experts in the various functional areas of PFI.

The remainder of this chapter provides the answers the following questions:

- Does PFI improve Innovation?
- Does PFI improve Quality?
- Does PFI improve Efficiency?
- Does PFI improve Attention to the Client?

7.2.1 Innovation

The key driver to promote innovation was cost reductions to improve the project's profitability. In technological areas the contractors remained rather conservative, the perception being that technological innovations would be too risky to implement.

In Lusoponte (Annex II) innovation was fostered mainly in the conception and implementation of programs to control operations in two areas: Logistics and Monitoring - Maintenance. At the time of construction in Portugal no other organisation in this area had similar systems The development of a Construction Quality Control program proved to be an opportunity to integrate the information collected in its Data Base in these two systems.

1 – Logistics associated with construction was strongly conditioned by a tight schedule (especially after the delays in the approvals) and the prospect of fines. It was necessary to co-ordinate several construction sites on the north and south bank, bearing in mind that all items could not be built simultaneously.

2 – Program of Monitoring and Maintenance currently in use by Gestiponte[1]. Consists of three systems:

- Structural monitoring;
- Routine inspection;
- Maintenance management.

The Structural Monitoring System is a contractual obligation and integrates all available structural data in a Data Base. It was developed by an external consultant, and has the particularity to integrate the routine inspection system reports or data, which in itself is an innovation.

The Routine Inspection System integrates the procedures, the operation planning, the maintenance manual, etc. The existence of a formal procedure is very important to Lusoponte's civil liability in the event of an accident. For example, if scrap falls off a truck and causes an accident, this might not automatically imply civil liability because it might be possible to prove that a maintenance team inspected and reported no defects 20 minutes earlier. Also, with accidents caused by animals crossing the carriageway the liability can be overturned if it is proved that the proper fences were in place.

[1] Gestiponte – The Operation and Maintenance sub-contractor of Lusoponte.

Gestiponte accepted full responsibility for accidents caused by animals when the works in the service area were not completed and the yard was not fenced.

This program also acknowledges proper Knowledge Management procedures, as it recognises that the experiences gained in O/M must be integrated in future norms and procedures. The O/M team was always present during construction, making it possible to retain within the organisation the accumulated knowledge. This proved to be vital for a good performance during the O/M stage making proper use of the created procedures and implemented systems.

The concession contract of the Victoria Dock Primary School (Annex III) had the innovative feature of considering the possibility for alternative usage of the assets after a first period dedicated to educational activities. The land where the school was built was leased to the Sewell group for 40 years The PFI contract for educational services is only for 25 years. After this period they can use the building for another 15 years and possible options for future utilisations are: continue as a school, disco, nursery, homecare, or any other that will suit the community's needs. The reason for the possibility of an alternative usage for the buildings is that in 25 years demographics in the area will change and there might exist no need for a school, and other utilisations will be more useful. After 40 years the buildings and the land are to be returned to council.

7.2.2 Quality

Quality improvements can be detected in several areas: service, process, methodologies, etc

Lusoponte (Annex II) sees its mission as the crossing of the Tagus in the most efficient, effective and safe manner, emphasizing the quality of the service provided, their competitors being boats and trains. So far, all stakeholders ranging from the shareholders to the users have expressed satisfaction with the project's quality of service. An Internal Construction Quality Control Program was implemented during

the early stages of the project. As a result construction proceeded with increased safety and speed Quality was also greatly improved by continuous cross checking. For example, during construction there were three entities always cross checking each other. At the operation/maintenance stage this Program evolved to a full quality certification for the company according to ISO 2000.

The head Mistress of the Victoria Dock Primary School (Annex III) seems very pleased to concentrate only on educational activities. Her role in the school management is of a performance monitor. The school built such a good reputation regarding the educational activities' quality, that as a direct result of demands from out side the estate a new building was completed in January 2001 permitting the accommodation of more pupils. PFI permits technical staff to focus on their core competences and relieves them from the administrative and managerial jobs, therefore it improves the quality of the staff's educational activities.

The same applies to other sectors like the example of the Manchester Fire Station (Annex VI), where a PFI scheme relieves the firemen from the administrative and managerial jobs enabling them to concentrate only in their area of expertise: fire fighting.

In the JSCSC (Annex IV) the Service Provision Quality Control is seen as key to success of the project. The operational risk, i.e., the risk that the private partner would be financially penalised by an unsatisfactory service, has been controlled in this project by self-monitoring. The Self-performance Monitoring Criteria assess the performance of the services provided against a benchmark that was negotiated within the contract with the MoD. The system is considered "fair" by both partners and is based on trust. The MoD has preferred to opt for this solution, utilising the partnering approach, instead of having a team on site to do the "contract monitoring". Usually this involved 12-16 people at a cost of at least £250,000 year, and that might not have a positive perspective to solve problems. The adopted system involves penalty points for specific events and stated thresholds, that if exceeded will incur a financial penalty. The information system interlinks this data on-line and the managers of the various departments have access to it.

The system consists mainly of a set of tables describing the events, for which a pre-determined number of points is attributed according to the occasion on which they take place: Normal, Audit or Key Events (Very important days when key events take place, usually involving about 12 days a year). If the event takes place in a Normal day the points to attribute will be the pre-set benchmark, if the event takes place on an Audit day the benchmark is multiplied by two, and if it happens on a Key event day it will be multiplied by three since it very important that service should be flawless.

Each manager has a standard template to fill in, and on a daily basis can control the number of points attributed and compare them with the benchmark. The system works on a 3-months basis, thus giving a good margin to correct problems.

Also in JSCSC there is an example of the need to qualify what is meant by Quality Service Specifications. *"Fit for purpose"* was introduced in the construction sub-contract to characterise the service specifications of some of the construction items. It proved to be the origin for several problems, because the purpose can change depending on the client's point of view. The most striking example is the 'Fit for purpose' of a fire escape: outside the bar there is a fire exit with a balcony and stairs to the ground. It happened that during the commemoration of Victory in Europe (VE) Day people, who were at the bar, went out to see the planes fly pass and the excessive weight caused the balcony to bend. It was designed for people to pass through not to stand, but as it didn't prove in that particular circumstance, the construction contractor was forced to redesign it and rebuild it as it was "not fit for purpose".

7.2.3 Efficiency

Efficiency is critical to a privately financed project to reduce costs to the minimum possible level and consequently increase profits. More efficiency leads both to correct schedules and reduced costs during the construction and the O/M stages. Efficiency is essentially related to cost control ranging from construction costs to O/M costs Efficiency improvements were noted in several areas.

In Lusoponte (Annex II) a great concern with efficiency was present since the project's inception and this translated into a very strict cost control regime. Without this philosophy it would have been very difficult to get construction completed on time and budget – avoiding penalties for delays and costs overruns. During construction there were two very difficult winters (especially 1995) and it was necessary to implement a very strict maximization of resources, and minimization of costs. One of the concerns was to find solutions that apart from the technical aspects would also be cost effective. If the concern regarding efficiency hadn't been expressed, solutions would have been found and implemented but certainly at increased costs.

It was critical to involve O/M prior to operations and they were involved from the very beginning of the project. The initial team had three members: the current Gestiponte O/M Director, an expert from the Dartford Crossing, and an expert from Eurotunnel. Their task was to evaluate the adequacy of design to simplify O/M, keeping its costs at the minimum possible level. For example, the access to the South Viaduct structure for routine inspections (check sensors, support apparatus, etc), were planned from the start: The existing suspension cables would not permit a cradle installation to access under the deck for inspection. The O/M proposed a project modification: the installation of a small fixed platform for inspection that would run beneath the 800 metres long deck. This resulted in a much more efficient maintenance programme.

Efficiency has to be closely monitored. There is always a danger in routine procedures. After 20 years the O/M staff that were first employed, (mainly) at the beginning of their active life, have aged, and this combined with the prolonged routinisation of tasks (boredom!) can reduce the quality level of performance.

Efficiency is also related to traffic. An increase in traffic, above a certain level leads to more accidents, and higher transaction and maintenance costs. As such, on the 25th April Bridge, that was nearly at full capacity, it was implemented a program to reduce shuttle traffic, i.e., from people that everyday cross the bridge to work in Lisbon. This type of traffic represents 25% of the overall traffic. If for example, it would be possible to increase the occupancy rate from 1.4 to 3 persons/vehicle, this would lead to a reduction in traffic and consequently a better service, more efficiency and reduced costs (several maintenance operations, like sweeping can only be done during the night, therefore at increased costs).

Another measure that increased efficiency was a different way to handle the Via Verde[2] receipts. Brisa – the first highways concessionaire - issues automatically receipts for every client and for every vehicle. This contrasts with Gestiponte where Via Verde's receipts are issued only on request, including all the movements for the same company. For example, a transport company doesn't receive different receipts for every vehicle, but only one receipt for all the bridges including all their vehicles. This reduces costs in mailing and processing, and is more efficient to both Lusoponte and their clients. In addition, many clients (90% of 250 000) are not interested in the receipt (or don't need) and by issuing only on request Lusoponte reduces costs.

Lastly, efficiency improvements can only happen with adequate human resources – A project like Lusoponte in the public sector would have difficultly in attracting the quality human resources needed to manage it. The private sector has total liberty to reward its employees according to merit, which is very difficult to achieve in the public sector where people are included in a very low pay, inflexible structure. This project in the private sector can attract adequate human resources, motivating them, and consequently achieving a better efficiency in the running of the company

The Victoria Dock Primary School (Annex III) was designed to have low maintenance costs, including reducing potential vandalism. For example they use external steel shutters (very uncommon in the UK) that although more expensive – higher initial investment and maintenance every six months - prove in the long run to be a good investment reducing (or stopping) the breakage of glass windows. As they pay for their own gas and electricity great effort was applied to design an energy efficient building (also not common in the UK). Some special features to reduce whole life cycle costs included: double glazing windows; walls with air in bricks to improve insulation; less expensive roof tiles that are replaced every 15 years instead of 25 years for the traditional aluminium foil; also they didn't isolate the concrete floor having considered that not much heat would escape thus saving the increased costs. Doors are painted (thus easier to repair) instead of varnished.

To reduce vandalism and for security and respective recurring costs they have put thick plywood beneath the roof tiles to prevent people breaking in.

[2] Via Verde – automatic tollbooth.

The JSCSC (Annex IV) was a Government's flagship project so it was very susceptible to state-of-the-art good industry practices like the Zero Defects Initiative that was introduced as a political advice from the DETR and the Partnering Initiative the political advice from the Construction Best Practice Program. The Zero Defects Initiative is related with construction quality and aims at no defects, while the Partnering approach is related with the project's procedures. **Partnering** can be defined (McDermott & Charmer 2001) as

> *'a long-term commitment between two or more organisations for the purpose of achieving specific business objectives by maximising the effectiveness of each participant's resources. The relationship is based on trust, dedication to common goals and an understanding of each other's individual expectations and values. Expected benefits include improved efficiency and cost-effectiveness, increased opportunity for innovation, and the continuous improvement of quality products and services'.*

These requests aim at getting a better project which in its essence good, but can constitute a risk for companies not familiar with these management techniques.

7.2.4 Attention to the Client

When analysing attention to the client it is necessary to consider that there are two possible forms of PFI: A free-standing project where the clients (service end users) are paying directly for the service like Lusoponte, or a DBFO where the clients needs are predefined and it is the public sector that pays against space, or service availability like the Victoria Dock Primary School.

In Lusoponte (Annex II) both partners dealt with attention to the client: The Portuguese Government through GATTEL took great care to profit from the opportunity and imposed terms and conditions related to the clients that otherwise wouldn't have existed. Meanwhile, the private partner' (Lusoponte) main concern was to provide

a service that would be both satisfactory in terms of safety and convenience. There was no real need to capture clients, since it was a vital infrastructure.

Lusoponte also take great care that the employees that are in direct contact with the public are polite, for example, the manual tollbooth operators. During regular daytime they are allowed a maximum 2 hours continuous service, not because of a lack of efficiency but because after that period of time they are naturally not so willing to serve the public with the adequate level of politeness (like saying thank you and smiling).

Gestiponte operates two bridges with different characteristics so their concerns regarding the clients differ in the two bridges. At the 25th April their main concern is to reduce traffic congestion and accidents while at the Vasco da Gama Bridge it is safety.

The contract doesn't include any penalty related to road safety, like minimum level of accidents. It is supposed that the bridges are according with legislation and the 'rules of good art work'. To reduce accidents at the 25th April Bridge Lusoponte implemented the following measures:

- A 6th lane was built, eliminating the use of the central lane that could function alternatively in both directions. The non-existence of a central barrier was the cause of many accidents, when two cars going in opposite directions would overtake simultaneously;
- Separators were placed after the tolls creating lanes conducting the cars towards the entrance of the bridge. The entrance to the bridge has three lanes, and constrains traffic creating enormous jams and small accidents when cars from 20 toll booths try to enter the bridge in an uncontrolled way.

At the Vasco da Gama Bridge Gestiponte's main concern is safety. The speed limit is between 100 and 120 km/h, and although the rate of accidents per km per bridge is half than of the 25th April they tend to have more serious consequences, due to the higher speed (At the 25th Bridge the speed limit is 60 km/h). Increasing security reduces the stress levels and fewer accidents happen. Also, as mentioned before, reducing traffic congestion leads to a better service: first, the clients are more satisfied, and the company's image is improved, second the company increases the service' efficiency, reducing costs always associated with accidents.

Lusoponte took the risk of expropriating all the land necessary for temporary and permanent works, including the risk of land price inflation and took great care to accommodate the needs of former residents that although not clients were directly

involved. On the north shore, there were two areas: the EXPO98 site– a disused industrial area and to the northern end, property was predominantly commercial and residential where 273 families were re-housed in new apartments constructed by Lusoponte or offered financial compensation. A new primary school was built at Portela to replace one demolished on the boundary of the Praça José Queirós access and an old age day care centre in Moscavide has been relocated. On the south shore land was predominantly agricultural.

The Government underestimated public reaction to raising tolls demonstrating that they were unaware of customer responsiveness. According to contractual terms, the tolls for each bridge where to be equalised. As a consequence of this the Portuguese State raised the tolls on the 25th April Bridge in June 1994. This caused a public outcry *(buzinão)* and the government was forced to rescind this decision. The toll will remain frozen at 150 escudos (for class 1 vehicles) until 2002, when it will be raised to 200 escudos (1 Euro). A rise of 1.5 times the Base Toll instead of 2.6 times. In addition, the Portuguese State imposed on Lusoponte a Frequent User Discount Scheme in August 1994 for users of the 25th April Bridge only. A 10 percent discount for users pre-purchasing books of twenty tickets with no date limit, and a 20 percent discount for users pre-purchasing books with a one month limit was introduced. A further scheme was introduced for the Via Verde, allowing a 50 per cent discount after the 13th trip within a month, and with all trips after the 72nd being free. As a result the Portuguese Government had to agree on six compensation packages required to restore Lusoponte's financial position in relation to the GATTEL Base Case.

Sewell the concessionaire for the Victoria Dock Primary School (Annex III) considers that their involvement in PFI projects changed their attitude to their business. They perceive that now they are more service oriented improving customer responsiveness accommodating the needs of the children. The service provided has proved so good with parents that the school had to build a second building to accommodate more pupils.

In Indiana (Annex V) the perceived needs can affect the client's connections to water and wastewater systems. This was the most important risk taken by the concessionaire and marketing campaigns are scheduled to promote the connections particularly to the wastewater sewerage network during the construction stage as it is very expensive and inefficient to make the connection to a consumer after concluding the main pipes'

installation. The connection to the wastewater sewerage is critical, because it is not legally mandatory and is generally considered to be the most profitable segment of the business. Its need is still not very well understood by all consumers, as they are used to discharging (at no cost) the wastewaters without treatment and now they would have to pay for that service.

In conclusion, the analysis of the empiric data points out at improvements in all '4Blocks' of Competitive Advantage and proved that PFI has a competitive advantage versus the traditional forms of governmental procurement. Long-term failure can be mitigated by continuous attention to the factors that originated the competitive advantage. Included in the Conclusions (Chapter 8) is a detailed account of the PFI Competitive Advantage.

Taking into account these research findings the research identified three areas that must be addressed (Chapter 2) to secure the sustainability of the competitive advantage: Political, social and economic environment that favours the utilisation of private capital and provides the adequate regulatory framework; Risk Uncertainty Management to improve mainly efficiency and efficacy and Critical Success Factors to ensure success and that influences all four factors. The three research areas were analysed from Chapter 3 through 6 and this Chapter draws on them and proposes an integrative model for the Sustainable Competitive Advantage of PFI. The next sections describe the SCA model, why it must be dynamic and iterative, discusses the need to be integrated in an adequate political and regulatory environment, and lastly how the two sub-models on Risk Uncertainty and CSF contribute to Better service, increased efficiency and continuous innovation, i.e., how the SCA model contributes to the improvement of all building blocks of competitive advantage of PFI. Lastly, the SCA is tested against the in-depth PFI case studies that were developed (Annex II through V).

7.3 The Sustainable Competitive Advantage model for PFI

The SCA model must be a dynamic, iterative framework that manages risk throughout the whole life cycle of the project, assuring that the knowledge gained in previous studies and previous stages is incorporated into subsequent projects. Kahkonen and Huovila (1996) introduced the concept of *'systematic project risk management'*, stating that it means advanced preparation and decision making for minimising the consequences of possible adverse future events, and to maximise the benefits of positive future events. Their model for the systematic risk management emphasizes that the several phases in risk management provide only a framework that, in order to be complete, must include a system of *'Continuous control, accumulation of experiences and know-how'*. The notion of continuous flow is to be applied throughout the project life cycle. Risk management must not be a static exercise; indeed, it must be a dynamic procedure continuous throughout the whole life cycle of the project.

PFI projects are dynamic projects that progresses constantly evolving throughout time. The SCA model takes into account this dynamic quality, and incorporates a constant re-evaluation not only of risks and their consequences, but extends it also to the evaluation of CSFs throughout the whole life cycle of the project. The preconditions for the assumptions that were made in their first assessment change continuously. Overall, the process is a **dynamic** and **iterative process,** where the knowledge gained from experience is incorporated in subsequent intra- and inter-project risk analyses ensuring that existing know-how and expertise from previous studies and previous stages, are always incorporated in the decision process. It is a vital framework for the focus on KM one of the CSFs in PFI. It values intellectual assets, fosters collaboration and knowledge sharing, and therefore improves decision-making.

The proposed model for the SCA of PFI (Figure 7.2) includes a dynamic and iterative framework and:

- An adequate political social and economic environment (Chapter 3);
- The whole life cycle risk uncertainty management sub-model (Chapter 5);
- The CSFs sub-model (Chapter 6).

These areas are closely interrelated and overlap in many issues that are represented by the overlapping of the sub-models on risk uncertainty and CSFs, which in turn are conditioned by the environment.

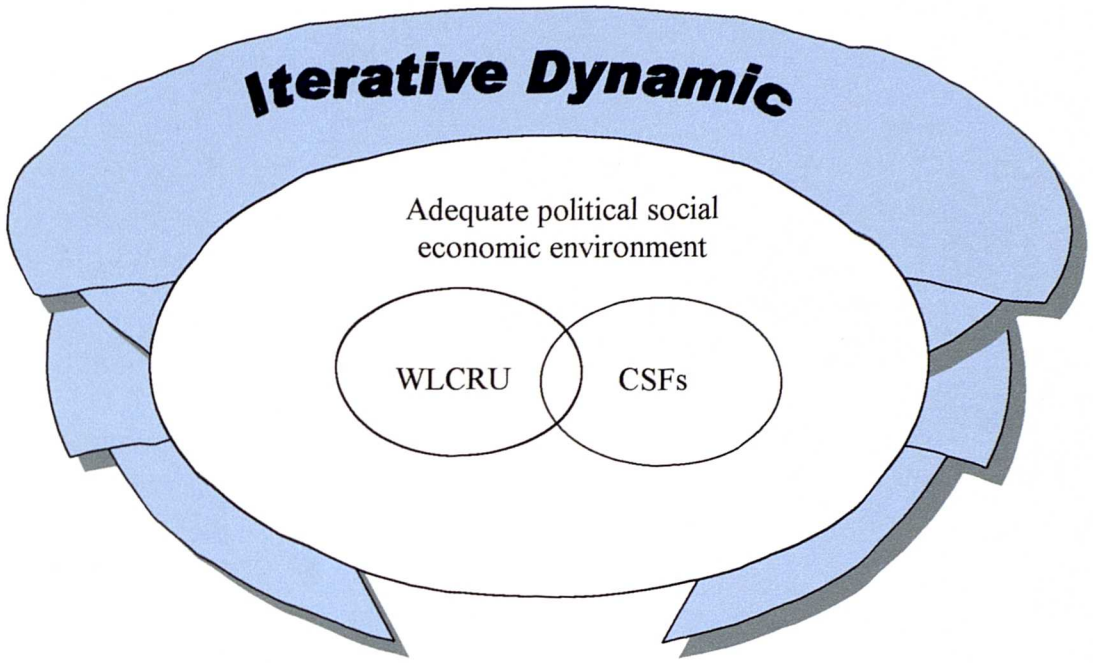


Figure 7.2. Proposed model for the Sustainable Competitive Advantage of PFI

As it was demonstrated in Chapter 3, economic growth and private investment are highly correlated with social and political stability and there is ample evidence that for PFI to succeed is necessary the existence of a supportive political, social and economic environment to ensure that the adequate regulatory framework - rules, regulations and policies - is in place. Very important is to tap innovative forms of finance and to create the conditions to develop the financial market. Life insurance companies and pension funds invest long-term and their risk profile fits the long-term debt issues of PFI, that are closely scrutinised projects usually seen as low risk. Also is the circumstance that EU is considering to limit pension funds investments in high-risk holdings. The EU member countries budgetary constraints imposed by the Maastricht Treaty works in

favour of off-balance sheet investments as PFI. Nevertheless, for the implementation of PFI it is necessary that the political will clearly demonstrates the resolve to modify the traditional procurement methods and embark on the PFI route. It requires flexibility, open mind and a desire for innovation.

The prevailing political social and economic environment is clearly favourable to the development of concessions, but PFI is a very specific form of concession and the experience of the UK and Portuguese governments shows that not all the necessary legal framework was in place. For example, in the UK Local Authorities had to correct problems related with Capital Finance. In Portugal, the financial market, at the time of the first PFI, was not developed enough to permit the contracting of a 'cap', i.e., to insure the risk of excessive increases in the interest rates. Also, in both countries there are also unresolved problems regarding accounting rules.

The WLCRUM model's main innovative feature versus the existing models of risk management is that it describes how the uncertainty of each risk type progresses throughout the whole life cycle. The main contribution to the sustainability of PFI competitive advantage is that it fosters improvements in efficiency and efficacy. It also can improve innovation, as when acting as a project management tool it looks in detail for the underlying reasons of uncertainty of the risks and provides an opportunity to implement measures to reduce uncertainty and hence favours innovation.

The model integrates three CSFs for a PFI project: Clear Strategy, Effective Leadership and Knowledge Management. It accounts for the need of clear objectives, of good project leaders both from the public and private sector and very importantly of KM systems. The focus on the CSFs ensures success by improving on all four factors of competitive advantage: Innovation, Quality, Efficiency and Responsiveness to Customers. Clear strategy impacts in all three competitive factors: better service (accommodating the client's needs) increasing efficiency (not wasting resources pursuing other objectives) and innovation providing a clear guidance. The private sector has traditionally had effective leadership, so is more dynamically efficient, and is a better allocator of resources, which increases the efficiency. KM is a structured procedure that has a direct impact in better service as it contributes to better knowledge

of the clients and, improves efficiency as it ensures that knowledge from other areas of the project, and from other projects is incorporated. The experience and learning that participants derive from the involvement in PFI projects has two major consequences: First, it increases efficiency throughout the process, especially in the bidding phase. The establishment of a climate confidence between the parties reduces uncertainty. The bidding process becomes easier, shorter and consequently less expensive. Second, private companies benefit from specialisation in the same sector.

Although each PFI project is unique, there are strong similarities among projects the risks involved and risk mitigation techniques. It stands to reason that companies having invested in the learning process of PFI bidding will want to capitalise on their knowledge by winning future projects within the same sectors.

7.4 Testing the SCA model

The SCA model was applied to the four in-depth case studies: Lusoponte (Annex II), the Victoria Dock Primary School (Annex III), JSCSC (Annex IV) and Indaqua (Annex V). As mentioned in Chapter 2, the theoretical replication was assessed. The logic being the test is to find if the model 'fits' or 'doesn't fit', and if different results are found they are for predictable reasons. Table 7.1 indicates how in each case study the three components of the model performed.

Table 7.1 Testing the SCA model

	Lusoponte	Victoria Dock Primary School	JSCSC	Indaqua
Adequate Pol/Soc/Ec Environment	Good political will, but '*wishful thinking*'	Good	Good	NO Central and Local Gov. had different agendas
WLCRUM High Uncertainty	Political Environmental Design	Good Small project well known sector	Design - very high	Political
CSFs Strategy Leadership KM	*Strat.* – IK *Lead.* – OK *KM* deficiencies in public partner Confrontational	*Strat.* - OK *Lead.* – OK *KM* fostered by partnership approach	*Strat.* + - *Lead.* – Private very bad *KM* – Bad with confrontational approach within the private consortium	*Strat.* Ill-defined from the Public partner *Lead.* OK *KM* – OK with Partnership approach
Outlook	Shaky Start-up with high level of litigation Good O/M	Very Good	The construction sub-contractor suffered heavy losses	?

In conclusion, the SCA model 'fits' with the events that developed within all four case studies. In the Victoria Dock Primary School there is almost complete coincidence with the proposed framework, and as the model predicted it is a successful PFI. In the others the degree of success/failure/problems varies but the model explains the underlying reasons as well it points out at possible solutions.

This Chapter proposed a model for the SCA of PFI concluding the presentation of the research goal. Chapter 8 presents the conclusions of the research together with a set of findings and recommendations for PFI stakeholders. Included are also suggestions for future research.

CHAPTER 8

Conclusions

This chapter concludes the dissertation, by listing the aims of the thesis and stating the original contribution that this study conveyed. It pursues by examining the models presented and assessing the extent to which the aims were attained, including some conclusions and practical recommendations for the public and private sectors. Lastly it presents suggestions for future research that constitute the study's natural development

The aims of this thesis, as stated in Chapter 1, were as follows:

- Has PFI proved to deliver a better service and VFM than the traditional forms of undertaking public projects?
- Has PFI proved to provide an adequate framework for risk allocation between the private and public sectors?
- Has PFI proved to be a competitive procurement tool?
- Has PFI the adequate conditions in the macro economic and political environment to develop?

8.1 Original Contribution of this Study

The main original contribution of this study is a framework to ensure the sustainability of the PFI's Competitive Advantage. As stated in Chapter 1, with this framework government and private companies will have a sound empiric basis for future strategic decisions on whether or not to pursue the PFI route. The proposed model for the Sustainable Competitive Advantage of PFI (Chapter 7) integrates three components: an Adequate Social Political Economic Framework, the WLCRUM model and the Critical Success Factors of PFI. According to the SCA model if a PFI project develops within the adequate environment (seen as a pre-condition to success) and if it applies the

models of risk uncertainty management and focuses in the critical success factors it will meet all the conditions to develop a sustainable competitive advantage.

The SCA model is holistic, systemic and contributes positively to the competitive advantage as it promotes efficiency gains, cost control, innovation and provision of a better service. The model encompasses the whole life cycle of the project and recognizes that the complexity stems both from the project and from the social and political environment. The model's dynamic and iterative characteristics assure that there is a continuous adjustment to the prevailing (and ever changing) PFI market conditions, and to the factors that originated the competitive advantage. There is the continuous assessment of each risk's uncertainty (and its causes) and of the CSFs.

Also an original contribution is the empiric evidence (Chapter 3) of the close relation between the macro economic and political context and the development (or not) of privately financed projects since the 17th century.

Another contribution is the characterisation of PFI (Chapter 4). This study proposes the PFI Holistic and Integrative Conceptual model that integrates a hierarchy of four levels of concepts: Government Ideology, Principles, Practices and Tools. The PFI model provided a basic framework for its conceptualisation and is coherent with the SCA. The PFI life cycle process, value chain and value-delivery network are mapped. The PFI competitive advantage is also assessed (Chapter 7).

Other original contribution is the methodology developed to identify the CSFs (Chapter 6). It is based on the analysis of the PFI aggregate cognitive map that conveys a clear picture of all the issues present in a PFI and respective inter-relationships. The advantages versus the traditional survey or check list based methods are that: first, there is no subjective interpretation of factors; second the maps analyse context, i.e., how issues inter-relate hierarchically recognizing the project's complexity; and third it is open, not biased by previous analysis.

Other contributions were four detailed case studies in the transports, education and water undertaking sectors (annex II through V). The research also included the collection of empiric data on particular aspects of other PFI projects. A standard case study protocol to present the case studies was also developed in co-authorship (Annex I). Case study research to test and validate the models was considered adequate for the research (Chapter 2). This assumption was present when Edwards (1998) emphasized the importance of case studies for the construction industry in his literature review of risk management in construction. In it he concluded that good case study research

would fill an important gap in our knowledge of the economic and financial risks of construction.

The empiric data collected permitted to establish a preliminary assessment of the variability of projects according to the company size, to the sector and the region (cross border variability). This led to a set of recommendations to the public and private sectors, as well as to the applicability of PFI to SMEs (Annex VI).

A brief description of the two sub-models follows including the reasons as why they contribute to the sustainability of the PFI competitive advantage.

8.1.1 The WLCRUM model

The WLCRUM model shows the uncertainty profile of each risk throughout the whole life cycle of the project. Uncertainty and risk are very often incorrectly used interchangeably as uncertainty is a feature of risk. The assessment of risks is the first step, and it must be followed by the analysis of each risk's uncertainty. The model's fundamental assumption is that in the long-term projects the evolution of the uncertainty attached to each risk is the key factor to manage. Managing to reduce (or mitigate) uncertainty is key to the project success.

The WLCRUM was applied to the PFI case studies and permitted to conclude that:

- The uncertainty attached to a specific risk varies – increases, decreases, appears, disappears – according the stage of the project's life cycle;
- Different sectors have different risk uncertainty profiles;
- Experience and learning effects (thus providing more information) decrease uncertainty;
- The evolution of design uncertainty is a good indicator of the degree of complexity of the PFI and or maturity of the PFI market in the sector. For example, in the hospitals sectors the design uncertainty has a higher value at beginning of construction and decreases slowly, while in the prisons it is

much lower indicating that the project is well defined as a result of previous experiences hence a more mature PFI sector;

- If uncertainty is high it means that there are few mitigation measures in place (probably for some risks there are none possible). If uncertainty can be reduced, it means that the risks are better managed, hence a project with a higher probability of success.

The WLCRUM main contribution to the sustainability of PFI competitive advantage is that it fosters improvements in efficiency and innovation. When acting as a project management tool it looks in detail for the underlying causes of the uncertainty. It then provides an opportunity to implement measures to reduce uncertainty through innovative and more efficient measures.

In conclusion, the WLCRUM model is an assessment and management tool for risk uncertainty. It provides a sound basis to the risk allocation between the public and private partners, and can also be used to structure strategic decisions regarding PFI. It can be used as a Decision Support System for Senior Management to assess the risk in long-term projects as it allows a clear view on how uncertainty progresses, avoiding the wishful thinking attitude that underestimates some types of risk (preventing the adoption of corrective measures). Project Managers can also use it as a project management tool as it forces them to rationalise the underlying reasons of uncertainty and provides an opportunity to implement measures to reduce it. Finally researchers can use it as a basis to develop models for the quantification of the long-term risk assessment in PFI (or other similar projects).

8.1.2 The PFI' CSFs

The PFI CSFs are: Clear Strategy, Effective Leadership and KM systems. These CSFs are closely inter-related in a continuous and iterative manner. With an effective leadership, clear strategic objectives are established and knowledge (and information) from previous and current experiences is continuously incorporated in the PFI.

Conversely, without an effective leadership clear strategy is difficult to achieve and the guidance necessary to implement KM systems will be missing.

The need for consistent strategies was apparent in Indáqua where the private partner complained that the excessively lengthy negotiation period was due to the non-existence of pre-defined objectives by the public sector. Another example of lack of clear strategy and incoherent strategies among stakeholders can be found in the JSCSC project. The constructor sub-contractor at start-up had poor information on design as no clear objectives were defined. This was followed by conflicting strategies between the design and construction teams. The end result were hefty losses to the construction sub-contractor.

One good example of proper KM procedures is the Information System that has been developed and set up by Lusoponte. All information is collected and managed since the beginning of the design/construction stage up to the most current O/M data. Among negative examples, is the confusion and loss of negotiation power to the public sector that prevailed in several tenders in Portugal. The public partner replaced the members of the negotiation teams (Lusoponte) or as in the case of the SCUTs where different public sector teams were simultaneously negotiating with practically the same private teams, without any mechanism put in place to exchange information among the various public sector teams.

A negative example occurs also in Lusoponte, where the government's negotiation team that supervised construction has no formal procedure to retain and disseminate the knowledge and experience gained during the negotiation and construction stages. As this team has a fixed period of existence when it dismantles this knowledge will be lost for the government. Different teams will conduct future projects not profiting from past experiences. Similarly in the UK, Hospital Trusts that have only 5 years duration, negotiate and conduct all the procedures but the experience gained is not used in future PFI hospitals, as the Trust is not appointed to other PFI projects. Bid experience and proper KM procedures related to the bidding stage are critical for PFI.

KM seen as the experience and learning that participants derive from the involvement in PFI projects has two important consequences: First, it increases efficiency throughout the process, establishing a climate of confidence between the parties that reduces uncertainty. The bidding process becomes easier, shorter and less expensive. Second, private companies benefit from specialisation in the same sector. Although each PFI project is unique, there are strong similarities among the projects, the risks involved and

the risk mitigation techniques. It stands to reason that companies having invested in the learning process of PFI bidding will want to capitalise on the acquired knowledge by tendering (with a better chance to win) future projects within the same sectors. Another underlying reason for this specialisation trend lies in the public sector criterion for bids evaluation wherein previous experience in similar projects is considered to be a good asset for a private company.

In conclusion, the CSFs contribution to the Sustainable Competitive Advantage of PFI is the improvement in all four factors of competitive advantage: Innovation, Quality, Efficiency and Responsiveness to Customers. Clear strategy enhances all three competitive factors: better service (accommodating the client's needs) increasing efficiency (not wasting resources pursuing other objectives) and innovation (providing a clear guidance). Finally KM increases responsiveness to customers (know who the clients are) and efficiency (knowledge from other areas of the project and from other projects is incorporated). The experience and learning increases efficiency throughout the process, fostering the establishment of a climate confidence between the parties reducing uncertainty.

8.2 Assessment of the Research aims

The next sections assess the extent to which the research aims were attained

8.2.1 Has PFI proved to deliver a better service and VFM than the traditional forms of undertaking public projects?

The focus on measures to control costs is always present. PFI is a procurement tool that has proven to be able to reduce the overall project cost by applying the VFM decision criteria because the decision to go ahead with a PFI scheme is only taken after proving that it costs less than the traditional methods of governmental procurement. Examples of better service and VFM can be found within the case studies:

- Victoria Dock Primary School made a great effort to design an energy efficient building as it was paying for its own gas and electricity. Some special features to reduce whole life cycle costs were among others: double glazed windows, large cavity walls with air pockets to improve insulation, less expensive roof tiles;
- In Lusoponte O/M was involved since the beginning of the project. Their task was to evaluate the adequacy of design to simplify O/M, keeping its costs at the minimum possible level. For example, the access to the South Viaduct structure for routine inspections (check sensors, support apparatus, etc), was planned from the start;
- JSCSC where the Self-performance Monitoring Criteria assesses the performance of the services provided against a benchmark that was negotiated within the contract with the MoD. The system is considered "fair" by both partners and is based on trust. Usually this involves 12-16 people at a cost of at least £250,000/year, and who might not have a positive perspective to solve problems. The current system involves penalty points for specific events, that if exceeded will induce a financial penalty.

In conclusion, from the analysis of the empiric data, PFI has proved to deliver a better service and VFM. The delivery of a better service is closely related with quality and attention to the client that are discussed afterwards within the PFI competitiveness. .

8.2.2 Has PFI proved to provide an adequate framework for risk allocation between the private and public sector?

The whole life cycle context in which the projects develop, not only the risks apparent at the time of the analysis but a clear perception of the possible outcomes (events) in the future is key to an effective RM exercise. Traditional RM techniques have been used extensively in the implementation of PFI projects. Nevertheless, these techniques fail to account for the holistic, systemic and very often for the full implications of the long-term nature of the projects. They fail to account for some type of risks and/or a wishful thinking attitude has led to over costs, overruns and other setbacks in several projects.

Usually financial and construction risks are very well accounted for, but less tangible risks like political and environmental are very often demised (or underestimated) with adverse consequences. For example:

- In Lusoponte the public partner underestimated the social impact of raising tolls on a bridge that by common knowledge had already been paid for, the public perception being that in due time it would be without toll. Undermining environmental issues led to the signing of contracts without an approved EIA.
- In JSCSC planning regulations surprises were not avoided even with the PFI' framework for risk allocation. At the time of the contract signing Laing Construction assumed that the construction was approved by the Local Authority Planning Department and had the construction works ready to start when they were informed that the building would only be approved if was 2 meters deeper than planned. The immediate major adverse consequence was that the building's foundations reached a very bad soil instead of rock as planned, and consequently costs escalated. The L.C. team had little experience and as a result the concession contract (and 28 schedules) became an implied document in the construction contract. Therefore the requirements of

untried/untested PFI concession became an implicit feature of all contractual negotiations.

PFI combines several unfavourable pre-conditions for decision-making. Often, the projects are new ventures in untested sectors, using untested methodologies. Therefore, the perception of a risky situation arises, frequently accentuated by the presence of ambiguity.

Another adverse condition for decision-making is that one of the decision-makers, the public sector is by nature risk averse. This context can explain the need for lengthy PFI negotiations and extended legal reassurances that are a way to deal with risk enhanced by the presence of ambiguity.

The partnership approach is clearly a very effective risk perception reducing mechanism. In Indáqua Feira throughout the project and both from the public and private partners, there was a partnering approach, the development of a sense of trust, and the understanding of the need to work for a common goal. This approach still prevails and proved to be essential to overcome some difficulties. This contrasts with what happened with JSCSC

In conclusion, there is room for improvement of the PFI risk allocation framework.

8.2.3 Has PFI proved to be a competitive procurement tool?

Next follows a detailed account on how PFI impacts on the '4Blocks' of Competitive Advantage: Innovation, Quality, Efficiency and Customer Responsiveness.

8.2.3.1 Does PFI improve Innovation?

The Authority, which is mainly concerned with an adequate service output, gives great freedom and flexibility to the actual design of the asset. Nevertheless, the attitude of the private sector towards innovation is rather conservative as it is perceived to be a risk factor. The greatest innovations are derived from the need to promote easy and cost effective long-term maintenance (including replacement costs), and also to provide lay-outs that can reduce the construction area (reducing initial cost) and provide the flexibility for different usages in the future. Another trend has been the increasing introduction of aesthetic criteria, in both design and colours.

An example of flexilibility for different usages in the future, is the Victoria Dock Primary School where the land the school was built has been leased to the Sewell group for 40 years, although the PFI contract is for only 25 years. After this period and for 15 years the buildings and land can have alternative usages such as: continue as a school, disco, nursery, homecare, according to the local residents' needs in 25 years.

In the prisons sector the private companies tend to specialise and bid only for projects within this sector, like Kvaerner. It is then possible to continuously innovate and improve construction techniques and design from previous projects (although it must be based on the modular design supplied by Her Majesty Prison Services). This contrasts with hospitals with little innovation due to lack of freedom given to the private sector. The National Health Service and the Hospital's Trusts have their own set of standards (technical specifications) which have to be included in the bid, leaving little room for innovation not giving to the private partner freedom to innovate and propose better (usually less costly over the whole life cycle) solutions for the provision of the specified service. This contrast with the Prisons where the private partner will replace existing technology with a new one if it means reducing costs, such as staffing that in the prisons

is all from the private partner unlike in the hospitals where technical staff – doctors and nurses - are from the public sector.

The design team and the operator should be involved in early stages of negotiation to foster innovation (maintenance cost reduction) and to assess future maintenance costs at an early stage. The designer has to be free to innovate. On a whole life cycle basis, an operator needs to consider the interaction between a more expensive design solution and lower operating and life cycle costs and vice-versa.

The contractors are very conservative in the materials they utilise, the usage of new construction materials is considered too risky in long-term projects as they are unproven in the long-term. It is the example of The Victoria Dock Primary School where the construction and design risks were minimised by adopting conservative design and construction techniques in which Sewell Construction had ample experience. The constructor even supplied all the materials, taking special care to use only those whose behaviour was well proven. Another reason is that the operator links the construction sub-contractor to building maintenance contracts. The liability for latent defects is the contractors unless they clearly specify the conditions of usage. For example: the vinyl floor in a hospital had lifting edges due to the use of incorrect cleaning agents; if the construction contractor hadn't specified the usage conditions he would be liable.

Both trends, of innovative design and proven materials, follow naturally from the requirement that the contractor is also the operator.

8.2.3.2 Does PFI improve Quality?

Quality in PFI projects is needed both to accommodate the expectations of the stakeholders and to reduce costs over the whole life cycle. The logic being that an emphasis on quality will also increase the operations efficiency and effectiveness. By quality it is meant a correct adjustment between the service provided and the degree of satisfaction of the stakeholders, i.e., their expectations are fulfilled.

PFI improves quality essentially through two mechanisms: Directly by the need to abide to the contracted service specifications, and indirectly in some areas like education, by allowing the staff relief from administrative tasks. Teachers can concentrate on their

core competences therefore enhancing the quality of the educational services provided. As for human resources, staff quality is also a key feature in the SPV' teams. For example, in Lusoponte and Indáqua it was strongly emphasized that staff's qualification and efficiency was much higher than it would be expected especially when comparing to management teams in projects of a similar nature.

8.2.3.3 Does PFI improve Efficiency?

The basic concept that underlies PFI, VFM in itself constitutes a measure of efficiency gains translated in reduced costs versus traditional procurement and management of public services. Improving the efficiency is paramount to reduce costs and therefore to increase the project's profitability. All empiric data indicates that efficiency gains are the main key driver in a PFI, which is closely related with Quality. One factor affecting the other interchangeably. One of the most important areas where PFI has improved efficiency is translated by the widespread usage in PFI projects of new managerial techniques sometimes introduced by the public partner' initiative, such as the Zero Defects Initiative (also closely related to quality) imposed on the JSCSC by DETR

Construction companies see PFI as an opportunity for providing a continuous flow of work, so to be efficient they have to specialise. In the early days of PFI projects' teams were involved in different sectors, but that has changed. Specialised teams are involved in only one area, their expertise being built on previous projects. Even large companies, such as Kvaerner, that are involved in PFI projects in various sectors – schools, roads, prison, accommodation, etc. - have developed specialised teams within the companies. For example, having identified the prisons market as an attractive market with a continuous flow of projects, and as Kvaerner plan to be involved in the forthcoming prisons' PFI, their design teams work in-between projects to improve prison design prior to the tenders. Another example is Carden Croft & Co that also sees specialisation as a key to success. They specialised in the Blue Light sector (Fire fighting and ambulances) because their operational needs are very similar, like the need for a quick response to the alarms, the existence of dormitories, etc.

8.2.3.4 Does PFI improve Attention to Client?

Customer responsiveness is clearly improved when dealing with a free-standing project where the clients pay for the service (Lusoponte, Indáqua). With a DBFO where the client needs are predefined and it is the public sector that pays for the service, it is necessary that the end users needs are accommodated within the contracted service specifications. It is not a real life market driven situation and it occurs in several sectors like prisons, schools and fire stations. If the public partner that discussed the contract is directly involved in the service provision there is a clear improvement in customer responsiveness. For example, in the Manchester Fire Station the public partner that negotiated the contract was the Greater Manchester Council, as it is the entity that administers the Greater Manchester Fire Service. They had a good sense of what was needed and were very much 'target oriented' with a great deal of commitment as they were dealing with their own business. When people are not as committed because they are told what to do this might not happen. Of course the end result is that the public in general got a better service. Besides these requirements Carden and Co, the contractor of the Manchester Fire Station, had also to take into account cultural adjustments in design, as fire fighters (that can be viewed as other type of clients) are very cultural specific. For example, they don't like open space offices (where money could potentially be saved) because they regard their own 'territory' as an important rank mark.

In conclusion, attention to either the direct client (general public) or to the indirect clients (like the fire-fighters) is improved as a result of the introduction of PFI.

The research concluded that PFI has a competitive advantage versus the traditional forms of governmental procurement as it induces improvements in all '4Blocks' of Competitive Advantage: Efficiency, Quality, Innovation and Customer Responsiveness. The PFI main block of Competitive Advantage is the increased efficiency brought by the need a strict cost control to deliver VFM. PFI has also improved quality and customer responsiveness but its incentive is mainly derived by the necessity to comply with the contracted service provision rather than by the usual market driven situation to attract clients. Innovation is rather conservative occurring mainly in the design stage to

reduce operation and maintenance costs rather than construction costs for which there are very well established project management techniques. For innovation to occur it is important the public sector willingness to consent to enough freedom and flexibility in the contract as to give to the private sector 'freedom to innovate'. In PFI there must be created a strong motivation to continuously innovate, in particular reducing maintenance costs. The attitude to avoid is the very dangerous inertia of people who think 'everything was done in this way and performing satisfactorily, why change it?'.

According to Porter (1990) lower costs and differentiation are sources of competitive advantage. This model is not contradictory with the '4Blocks', instead it is a different perspective to look at the same issues. Cost control over the whole life cycle is behind the drive for innovation, efficiency and quality. Also PFI clearly differentiates from other forms pf public procurement. So both models acknowledge PFI' competitiveness.

In conclusion, currently PFI has a competitive advantage versus the traditional forms of governmental procurement. The advantage's sustainability is going to depend upon the continuing focus throughout the whole life cycle on efficiency gains (cost control), innovation, quality and provision of a better service. This dynamism is one key feature that was incorporated in the proposed SCA model.

Next follows the answer to the fourth and last research aim.

8.2.4 Has PFI the adequate conditions in the macro economic and political environment to develop?

The political and economic context was determinant, a pre-condition, for PFI development. PFI emerged as a response to government needs for funding of public projects, and was also favoured by the prevailing political and macro economic environment. The future environmental conditions are always a question mark. If the political and economic climate remains favourable then PFI has a future. If not, even the worst case scenario of nationalisation can materialise as in the past with concessions. The government acting as a sponsor has also the responsibility to create the adequate regulatory environment for PFI to develop. At the beginning of the 20th

century, concessions brought on themselves their felling out of favour in great part due to the abuses of dominant positions. PFI must profit from this lesson and avoid the same mistake.

From the analysis of the content of the previous sections it can be stated that the research has permitted to draw conclusions and consequently fulfil all four research aims. The answers to the questions provide also a valuable insight on how to pursue the PFI route. It is also possible to draw some conclusions and recommendations for PFI stakeholders, the promoters size and the variability across sectors and regions, that follow. These conclusions stem from the data collected and are ancillary as to the stated research aims. Nevertheless the decisions to include them was based on the fact that these would enrich the analysis and permit a better overview of the complex context in which PFI develops. These areas also provided valuable insight to the definition of future research areas.

8.3 Conclusions and Recommendations

8.3.1 Conclusions and Recommendations for PFI Stakeholders

It is vital that all stakeholders involved in the PFI market adapt to the this novel way to do business. The need for changes in the organisational culture is profound.

A key lesson drawn from the research is that a PFI project must be a good deal for all stakeholders. It's a long-term relationship where opportunistic moves will cost dearly. Neither the public nor the private partner can assume that one can take advantage over the other. A 'Good' or 'Successful' PFI has to accommodate the needs and expecations of all stakeholders:

- VFM for the Public Sector;
- Return on Investment for the Private Sector;
- Better Service for the Users.

The partnership instead of the confrontational approach has already been recognized by the U.K government as a route to pursue with PFI (the importance of common visions and strategies becomes clear). The decision taken by Sewell to promote a 'Community Dividend' from the profits of the SPV is a good example. In contrast, in JSCSC the public sector got a good deal, with the project on time and on budget, assuring the delivery of a service on a guaranteed benchmark. However this was at the expense of heavy losses for the construction sub-contractor. This is not sustainable because if the private sector (where the construction companies are included) gets the perception that they stand to lose money, then PFI will no longer be perceived as a viable route. There must exist a perception of fairness throughout the process.

One criticism is that in some successful PFI projects, the private partner gets 'unfair' profits - often from refinancing debt. The Treasury is considering the inclusion in the contract of provisions so that part of the earnings will also be transferred to the Authority.

Very importantly it must be realised by all stakeholders that PFI must be an open project. There must be a mandatory continuous assessment of the project, to adjust it to the market and technical developments and sustain the competitive advantage.

It is important to develop PFI training skills, both for the public and private sectors, covering project (or contract) management and technical skills. Training must also cover soft skills like: communication, interpersonal relationships and team teamwork, all of which play a key role in PFI.

8.3.1.1 Conclusions and Recommendations for the Public sector

- In a PFI the government can't waive its responsibility for the provisions of a public service it only changes the type of responsibility, which very often brings an increase in its technical and political complexity. Delegating the service to the private sector means that the government has to adopt legal and regulatory mechanisms to ensure that the service is provided efficiently and the responsibilities assumed by the private sector are fulfilled;
- The applying, monitoring and enforcing of rules all must be in accordance, otherwise rules may remain the wish of the regulator;
- Clear and consistent strategies are key. The opposing strategic approaches only introduces confusion, and if a PFI service output definition is in discussion it will be even more difficult to define;
- Improve the framework for Knowledge Management within the governmental structure. It is critical to set up formal procedures to disseminate the knowledge and experience gained during the negotiation, construction and operation stages. Otherwise with no formal procedure to retain the knowledge this will be lost for the government. The UK Government has in each Ministry it's own PFU (Private Finance Unit) that centralises and disseminates information regarding the PFI projects;
- Project Finance is a demanding tool. Since it relies on the cash flows of the project, it requires the exhaustive identification, analysis, allocation and mitigation of all risks. This is a complex process, subject to a great deal of

uncertainty and lengthy negotiations, but the decision process in PFI can be improved by reducing ambiguity and perceived risk;

- There is the need to improve the procedures during the bidding stage, for instance, introducing drop dead dates to avoid lengthy negotiations;
- There is the need for complete information, a stable design and predefined scope of works (no additional works) at the time of the signing of the contract. It is necessary to avoid common procedures as in the traditional methods of procurement where the client keeps asking for alterations and the constructor presents new cost estimates for additional works. This usually leads to significant cost overruns and to a high level of litigation and claims from the private partner.

8.3.1.2 Conclusions and Recommendations for the Private sector

- As the concessionaire is responsible for both the construction and maintenance, it has a strong incentive to minimise costs on a whole-life cycle basis, and not to pursue initially cheaper solutions that in the long run would be more expensive. Innovation appeared essentially with new designs more efficient and cost effective to operate and maintain through the whole life cycle of the project;
- Mainly due to the involvement of financial institutions projects are closely scrutinised, both in terms of technical details but also their financial consequences;
- Legal costs are considered too high, but a good legal adviser is key to a good contractual agreement;
- PFI also induced innovation in the financial and insurance sectors. In the capital markets sector there were innovative forms of bond issuance and the use of holistic insurance schemes;
- Insurers must be involved from the beginning of the process of risk allocation, as they also take risk. The client usually builds the risk matrix, negotiates it

and only then asks for insurance coverage. But the insurance company may not agree and the whole process has to be repeated increasing the tender costs;

- The Human Resources of the concessionaire are typically highly qualified, with wages above average;
- Construction companies see PFI as an opportunity for providing a continuous flow of work, so to be efficient they have to specialise;
- The emergence of the notion of Corporate PFI. This derives from the notion of service provision and is an extension to the application of PFI to the private sector. The authority is replaced with a corporation, e.g., M&S will build an office block for headquarters with this scheme. This will permit to 'concentrate' in their core business.

The main recommendation to the construction industry is the need to focus on KM, disseminating knowledge throughout the industry, improving communication and integrating the supply chains.

The next sections include some remarks drawn from the study like the variability in PFI projects according to the promoters size, the sectors and the international context.

8.3.2 Conclusions and Recommendations on Promoters size

The main questions related to the problems that SMEs face in the PFI market, and on the strategies that they can adopt (Annex VI) are:

- Is the PFI market adjusted for SMEs?
- Are SMEs being left out of the PFI market?
- Is it feasible or not for a SME to act as sponsor in a PFI project?
- Does a SME have the required technical and financial capacity?
- Does a SME have any advantages in entering the PFI market?
- Which are the main constraints for SMEs in the PFI market?

Regarding the first question - Is the PFI market adjusted for SMEs? This study concluded that Yes. SMEs can play a role in the PFI market, but paying attention that SMEs must choose the right segment/niche (McDonald & Dunbar 1998). [1]

The empiric data collected provided an understanding on how the PFI market functions and on the key variables to the public and private partners. As such, it is proposed (Table 8.1) the following segmentation variables, or dimensions, adequate to differentiate between projects are: The *Dimension of the sponsor* and the *Dimension of the contractor*. The market can then be divided into homogeneous segments characterised by the relative dimensions of all parties.

It is this study's proposal that to apply to the PFI methodology to SMEs, that '*there must exist an adjustment of the project's dimension, to both the concessionaire' and authority' dimension*'. The sponsors of a PFI can be the Central Government that usually launches large projects (defined in terms of project cost)[2] and Local Government that can launch all types of projects from large to small.

[1] The definition of McDonald & Dunbar was adapted as ' *Market segmentation – is a processes of splitting the market into different groups or segments, within which the projects have the same or similar requirements*'

[2] Large PFI over £100 million, Medium PFI £50-100 million, Small PFI less than £50 million. Small projects can be bundled to get a larger project.

Table 8.1. PFI Market Segmentation

	Central Government		Local Government or Corporate PFI	
	Large PFI	*Small PFI*	*Large PFI*	*Small PFI*
Large Companies	**Highly Appropriate**	Not likely to occur	Appropriate (conditionally)	Not Appropriate
SME	**Not Appropriate**	Not likely to occur	Not Appropriate	*Highly Appropriate*

It is reasonable to expect good results when the negotiation teams from both the public and private sectors are balanced in terms of dimension and expertise. Special attention has to be paid to large companies and small sponsors (Local Government or Corporations), where the public team cannot be understaffed and has to be balanced with the private sector team in dimension and expertise.

The adjustment between the relative dimensions of project and sponsor makes sense as small projects require fewer resources and a narrower range of expertises than large projects. It is important to note that it is the range of expertise that is in question not the degree of specialisation. In effect the research points out that small PFI projects are more suited to specialised companies that operate in market niches. In conclusion. SMEs can play an important role in Small PFI projects, which very often are not very attractive to large companies.

The key lessons to remember are:

- Small companies can't afford to lose upfront costs;
- If financing is solved a SME can be the concessionaire of a successful PFI, specialising in low risk sectors. Traditional corporate loans (or equity) are always viable options, but the access to other financing like capital markets is not adapted to SMEs;
- PFI is very demanding on the provision of good quality services and SMEs face specific constraints regarding the availability of technical and human resources;

- SMEs can always be sub-contracted in a PFI, which might give them increased security ensuring, over a longer period of time, a steady stream of income. But even then SMEs must be aware that PFI has stringent demands regarding efficiency and quality and that a sub-contractor must also abide by this philosophy;
- Lastly but critical: If SMEs are to be a player in the PFI market the Government must provide appropriate guidance and include in its strategic objectives a legislative and regulatory framework adapted to SMEs.

8.3.3 Conclusions and Recommendations for Differences Sector Wise

Based on the research four factors emerged as potential differentiators of the sectors. These are:

- Social Costs / Social Visibility;
- Uncertain Revenues;
- Degree of Empowerment and Decision Process;
- Degree of Maturity.

Social Costs / Social Visibility - PFI projects in sectors both sensitive and visible, and that can affect the public in an irreversible and adverse way, have the potential for high social costs. The situation worsens if there exists no alternatives for the service. It is possible to identify *a priori* sectors particularly sensitive to social costs, like some IT projects.

In IT projects often there is an old system in place that provides the service, when one system has to be replaced by another this poses the problem of existence or not of alternatives to the provision of the service when the public is the client (high social visibility) This makes the transition particularly sensitive and visible. An example to remember is the public outcry (Financial Times 1999) when IT projects went wrong with the British passport agency and social services.

In contrast, in a road the service to be provided is the access from one location to another. If construction lags behind schedule or if there is a technical problem, traffic can still flow the old way. Also it is a well-known sector where a project if correctly managed has very few uncertainties regarding completion and performance.

Uncertainty of revenues - The major problem relates with the existence, or not, of clear and identifiable revenues, and how this risk is split between the public and the private partner. This is critical for the private partner as it is from the revenues that its profits come from. Uncertainty of revenues varies across sectors. For example, in an Hospital there are usually two streams of cash-flows, that are both easily identifiable and controlled: First, an Availability Fee for providing a pre-defined number of beds and maintaining the hospital running in good order; and Second, a Service Fee, for providing 'soft services' such as catering, laundry, waste management and telecoms. As hospitals are often large and complex to operate and maintain, both stream of cash-flows are subject to great uncertainty and often it is not possible to identify the stream of revenues throughout the life of the project. Nobody knows what is going to happen with certainty in the long-term maintenance in hospitals. It is still an untested sector for PFI and traditionally surprises are very common. Day-to-day maintenance is different, it can more easily be predicted.

Another example for uncertain revenues are IT projects. These have a high degree of uncertainty of outcome, in terms of timing (completion risk) and performance. The payments are often related to the performance of the system, such as savings achieved from the implementation of the system or volume of business the system handles. First they deliver the prototype, receive the first payment, and sign the contract. Full payment is only after the total development of the system is completed. The problem is that the provider doesn't know how long development and implementation will take.

Degree of Empowerment and Decision Process – Stª Maria da Feira Municipality, the Authority in the Indáqua project, suffered the consequences of lack of Decision Power and of Empowerment within the governmental system. An important lesson to draw is not to sign contracts for which one doesn't have to rely on future decisions, as when there was no firm (written) commitment from the Central Government to allow the Municipality access to EU funding

Having the Decision power concentrated instead of distributed makes a big difference in the bidding stage. Too many parties involved imply constant revisions like in the hospitals sector. The culture in hospitals is risk averse, and there are many social and

politically sensitive issues. Negotiations are lengthy. Usually only about 1/3 of design is defined at the beginning of construction. Table 8.2 summarizes the differences between the Hospitals and Prisons procedures to define the detail design. In Hospitals the Heads of Department are always included in the Decision Process which leads to extensive and difficult negotiations..

Table 8.2. Main Differences of PFI between the Hospitals and Prisons Sectors

Hospitals	Prisons
Hotel Services from the Private sector Operation is from Public sector	Total Operation for the Private sector, that provides Staff + Maintenance + Education + Accommodation.
• One Trust (experience gained is lost) • Negotiation procedure with too many Heads of Department • Real negotiation	• Authority capitalises past experience • Local Authorities (like Fire station) • Operator led the design
The procedures are not straightforward: • General specification – Heads Department • Trust • Short List • Present options (3 usually) • Heads of department will go along with that? • Negotiation follows	

Degree of Maturity - The various sectors are in different stages of maturity as it is indicated by the trends in design uncertainty. It seems reasonable to assume that the degree of maturity of the sectors is closely related with experience gained in previous projects that has permitted to minimize the social costs, to reduce the uncertainty of revenues and improve the empowerment and decision process. Alastair Campbell (1999) from the Treasury Finance Policy Team classified the sectors according to the development of PFI projects as Mature, Developing and Emerging.

Mature Sectors include roads and bridges, prisons, hospitals, government office accommodation and low-mid technology defence projects. Developing Sectors include tolled motorways, trams and metro, street lighting schemes, court buildings, schools, universities, IT projects and water and waste treatments plants. In the Emerging sectors

are included Social Housing and Regeneration projects, advanced defence projects, city centre traffic management scheme and multi-sector projects.

In conclusion, there are factors that can condition 'a priori' the performance of a PFI. It is important that all the stakeholders are aware of them to permit a more correct adjustment of risk management procedures.

8.3.4 Conclusions and Recommendations on Cross Border Variability - The International Context - Portugal

The research has permitted to draw some preliminary conclusions on the impact PFI has had on the competitiveness of UK construction industry enhancing the four blocks of competitive advantage: Innovation, Quality, Efficiency and Attention to the Client. It has also developed the way the construction industry is managed. There is the widespread use of management tools like whole life cycle costing, risk management and benchmarking.

In the UK, PFI also induced the communication through an increased functional integration of the traditionally vertically fragmented UK construction industry, forcing the interaction and feedback from all the stakeholders in a project.

The introduction PFI in Portugal has had some beneficial consequences to the private sector that incorporated well the knowledge and experience gained. For example, some Portuguese members of the Lusoponte consortium participated successfully in subsequent tenders for DBFO roads (SCUTs). In the Portuguese SPVs there is a marked effect on corporate culture when comparing with the prevalent organisational culture in other Portuguese companies. There is a greater emphasis on efficiency, cost consciousness, whole-life cycle costing, accountability and also the notion that the client is important both in terms of safety and satisfaction (see Lusoponte, Indáqua). Also, the process is totally transparent, which is something not common in the Portuguese corporate culture, particularly the construction sector which is notorious for its culture of secrecy.

However some difficulties were encountered: The public sector's negotiation abilities are very unsatisfactory and there is a difficult co-ordination with the public partner. For example, in Lusoponte it was easier to deal with only one entity like the GATTEL. After completion of construction it is more difficult because as GATTEL is dismantled different entities with different opinions and no central directive have to deal with Lusoponte. Difficulties were also encountered during the negotiation as the government changed, most members of the negotiation team were replaced and had no previous knowledge of the contracts in discussion. The Lusoponte file had 114 different

documents in discussion, which were well known to the previous members, as they were the ones that were involved in drafting them. The government has put itself in a weak negotiation position and the same happened with Indáqua where the Public negotiation team was clearly under-staffed.

Very often contracts are signed underestimating the risk of environmental issues. This led to the signing of contracts without an approved EIA, with disastrous consequences. For example in Lusoponte as the EU conditioned the availability of funds to the existence of an approved EIA the private partner had construction delayed six months on a very tight schedule. The same happened in some SCUTs as construction was halted because the whole length of the road didn't have an approved EIA.

Some key aspects to a correct development of PFI in Portugal, are:

- Central Government must make clear if it considers PFI an option or not. There are divergent opinions, as some politicians see PFI a danger to avoid as it pawns future generations incomes. Unlike in the UK there is no government commitment to the PFI route. Ministries apply the technique on a one-by-one project basis without any central guidance;
- There is the need to clarify what is a PFI. There is a widespread minimalist sense that PFI is project finance that utilises private funding for public projects, missing framework of the PFI conceptual model (Figure 3.1) and the key aspect that a PFI contract if for service provision not asset construction;
- The legal and regulatory framework must be adjusted, namely the possibility for bond-issuance to finance the projects and adjusting accounting rules;
- Projects must be assessed for VFM (up to the present none was).

The research provided insights as to suggestions for future research which are synthesized in the next section and conclude the dissertation.

8.4 Suggestions for Future Research

This thesis has presented the research undertaken to propose a model for the sustainability of PFI's Competitive Advantage. These suggestions for further research derive naturally from the scope of the current research that identified several empirical and practical areas that constitute its natural extension. Some extensions constitute natural developments of the research while others are related to the limitations of the study. The models developed are of a tentative nature and the empiric and academic data collected had limitations. For instance: The assessment of literal replication, or similar results expected, undertaking for example, three case studies on the same sectors, has not been done because it was outside the scope of the current research which was limited to testing the applicability of the models to different sectors, to get the overall context of the PFI market.

The suggestions for future research work are divided in: The potential utilisations of the quantification of the WLCRUM (which constitutes a natural development of the study) and the extension of the models to study the variability across the sectors and different regions to address some limitations of the study and to permit to draw conclusions adapted to each sector/region based on a sound empiric basis.

8.4.1 WLCRUM Quantification

The research findings should be pursued on a more quantitative approach. The establishment of benchmarks and standard metrics is a very important research area that stems from the current research. The quantification of the WLCRUM will permit to extend research to various research areas:

- Project's Uncertainty Levels. To develop uncertainty scales to identify if a project is low or high risk. Decisions can be made over a single project. If the risk uncertainty level is considered unacceptable the project is either rejected or reformulated, but if the risk uncertainty level is acceptable the project can proceed. The risk scale can also be used to compare several projects, rank

them making possible an informed decision on the priorities to undertake the projects;

- Sector's Uncertainty Levels. A characterisation of each sector - transports, prisons, IT - by a β type factor (similar to the stock and bonds risk level) could influence the projects financial rating and therefore the loan's lending rates;
- Risk Type Uncertainty Level. A similar β factor can be applied to the individual analysis of each risk type. It would be possible to assess, for example, the political or the construction risk level and then according to the level make a pre-agreed risk allocation, as suggested in Table 8.3. If the uncertainty level is too high then the risk it is to be returned to the public sector; if uncertainty is average then the risk could be shared and if uncertainty is low should be transferred to the private sector. The sum of all risk uncertainties would be the project's risk uncertainty.

Table 8.3. Risk Uncertainty Level and Agreed Allocation

	Returned	Shared	Transferred
High Uncertainty - $\beta>1$	∀		
Average Uncertainty - $1<\beta<0$		∀	
Low Uncertainty - $\beta<0$			∀

- To study the relation between the risk uncertainty and the degree of PFI development within a sector, thus enabling a classification of the sectors from PFI mature to PFI emergent. This should be interlinked with the proposed development on sector βs.

For the quantification of the WLCRUM model is proposed Fuzzy Logic which is particularly adapted to uncertainty analysis as the reasoning on uncertainty is based in feelings, vagueness and ambiguity. The risk levels of different projects can be normalised, i.e., be in a common scale to compare the risk levels of different projects. For each project it is then possible to have its risk level characterised by a numeric factor permitting the risk ranking of projects.

8.4.2 Region and Sector-Wise

The research focused on the overall adequacy (applicability) of the models to different sectors, but it open remains the question on: 'Which are the main risks that can differentiate the sectors', or 'Is there an adequate risk allocation sector-wise?' Table 8.4 presents a suggestion as to what could be the most important issues (or key issues) that have the potential to differentiate the sectors: Social Costs/Social Visibility, Identifiable Revenues, Completion Risk, Obsolescence Risk, Demand Risk and Performance Risk. The research should be pursued as to assess the key issues sector-wise and therefore permit a more correct risk allocation.

Table 8.4. Relevance of Risk Type by Sector

	Uncertainty of outcome (Completion Risk)	Social costs, Social visibility	Alternative service (Obsolescence Risk)	Identifiable revenues and cash flows	Identifiable Service specifications (Performance Risk)
Transport				Key Issue	
Hospital		Key Issue		Key Issue	
IT	Key Issue		Key Issue	Key Issue	Key Issue
Custodial Services				Key Issue	Key Issue

8.4.3 Other Suggestions for Future Research

Further suggestions for future research are:

- The assessment of CSFs in the PFI projects by sector – transports, health, etc.;
- The establishment of benchmarks and milestones to assess the Blocks of Competitive Advantage - Innovation, Quality, Efficiency and Responsiveness to Customers - by sector;
- The study of the Competitiveness in different regions. The current research studied PFI and similar projects in the UK and Portugal, but though the regional covering was limited, it was found that cultural differences appear to be a factor that influences PFI competitiveness. This finding should be

confirmed and systematically studied to find how different cultures and social/organisational values influence the development of PFI.

As future practical developments for the research the study tested models, gathered information and provided a set of conclusions and recommendations that can constitute a sound empiric basis to develop practical tools such as best-practice guidance for PFI stakeholders, like Governments, Contractors and Financiers.

CHAPTER 9

References

References to Chapter 1

Broadbent, J. & Laughlin, R. 1999. 'The Private Finance Initiative: Clarification of a Future Research Agenda.' *Financial Accountability and Management,* 15 (2), 95-114.

Brown, C. 1999. 'UK Public Private Partnerships.' *International Financial Law Review,* July.

Campbell, A. 1999. Key issues for the UK's Private Finance Initiative. Paper presented to the Conference Financing Infrastructure for Europe, Nicosia, 20-21 October.

Clarke 1996. 'Coming of Age for PFI - News Update.' *Private Finance Initiative Journal,* 1 (4), 17.

DETR 1999. *Public Private Partnerships and the Private Finance Initiative.*

Financial Times 2002. *Koizumi to step up pace of privatisation.* 8 March.

Haque, N. 1996. The Private Finance Initiative (PFI) - A theoretical and practical examination of the policy, and its potential to procure services in the Higher Education (university) sector. MBA Thesis, Imperial College.

HM Treasury 1997a. *News Release - City Heavyweight Takes his Seat at Head of New Treasury PFI Taskforce.* 18 August.

HM Treasury 1997b. *News Release - Top Notch Taskforce to Reinvigorate PFI.* 22 September.

HM Treasury 1997c. *News Release - Partnerships for Prosperity: A New Framework for the PFI.* 4 November.

HM Treasury 1998. *Modern Public Services for Britain: Investing in Reform. Comprehensive Spending Review (CSR): New Spending Plans 1999-2002,* July.

HM Treasury 1999. *Budget 1999.*

HM Treasury Taskforce 1997. *Taskforce Guidance - Partnerships for Prosperity.* November.

HM Treasury Taskforce 1998. *Press Release - Geoffrey Robinson Unveils Second Significant Projects List.* 21 October.

HM Treasury Taskforce 1999. *Modern Government Modern Procurement.*

HM Treasury Taskforce 1999a. *Press Release - More Private Finance Initiative Deals Expected as Clarity of Accounting Standards is Resolved.* 24 June.

HM Treasury Taskforce 1999b. *Press Release - Shake-up for PFI and Government Procurement Plans will save Up to £1billion.* 22 July.

HM Treasury Taskforce 1999c. *Press Release - Treasury Taskforce PFI Standard Contract Guidance Launched.* 14 July.

HM Treasury Taskforce Guidance 1999. *Projects Signed Since 1 May 1997.*

HM Treasury 1993. Chancellor of the Exchequer addresses the Annual Dinner of the Scottish CBI in Glasgow 9th September.

Kerr, D. 1998. 'The Private Finance Initiative and the Changing Governance of the Built Environment.' *Urban Studies*, 35 (12), 2277-2301.

National Audit Office 1999. *Examining the value for money of deals under the PFI.* HC 739 Session 1998-99, 13 August.

Partnerships UK 2000. *Press Release - Partnerships UK Open for Business.* 13 June.

Partnerships UK 2001a. *Press Release - Andrew Smith Announces Sale of 51 per cent of Partnerships UK to the private Sector.* 27 February.

Partnerships UK 2001b. *Press Release - Successful Capital Raising for Partnerships UK.* 3 April.

Partnerships UK 2001c. *Press Release - New Business Opportunities to Create Public Private Partnerships.* 19 December.

Warner, A. 1998. 'PFI Spotting: The PPP Track.' *The Banker*, 148, 24-27.

Warner, A. 1999. 'An idea on the Move.' *The Banker*, 149, 32-33.

Wilson, T. 1999. 'PFI - The Private Finance Initiative in the UK.' *Infrastructure Journal*, Winter, 35-43.

References to Chapter 2

Ackerman, F., Eden, C. & Cropper, S. 1992. Getting started with cognitive mapping. Paper presented at the 7th Young OR Conference, University of Warwick, 13-15 April.

Ayyub, B.M. & Gupta, M.M. ed. 1994. *Uncertainty Modelling and Analysis: Theory and Applications*. North-Holland, Elsevier Science.

Baccarini, D. & Archer, R. 2001 'The Risk Ranking of Projects: A Methodology.' *International Journal of Project Management*, 19, 139-145.

Banxia 2001. www.banxia.com

Bullen, C.V. & Rockart, J.F. 1981. 'A primer on Critical Success Factors.' *Sloan WP n. 1220-81*, Sloan School of Management, MIT.

Buzan, T. 1993. *The Mind Map Book*. BBC Books.

Carroll & Johnson 1990. *Decision Research: A field Guide*. SAGE Publications.

Chua, D.K.H., Kog, Y.C. & Loh, P.K. 1999. 'Critical Success Factors for Different Project Objectives.' *Journal of Construction Engineering and Management*, 125 (3), 142-150.

Creswell, J.W. 1998. *Qualitative Inquiry and Research Design – Choosing among Five Traditions*. SAGE Publications.

Eden, C. & Ackerman, F. 1998. *Making Strategy – The Journey of Strategic Management*. SAGE Publications.

Eden, C. 1988. 'Cognitive Mapping.' *European Journal of Operational Research*, 36, 1-12

Hill, C. & Jones, G. 1995. *Strategic Management – An Integrated Approach*. 3rd ed. Houghton Mifflin Company.

Lee, T.W. 1999. *Using Qualitative Methods in Organisational Research*. SAGE Publications.

Miles, M.B. & Huberman, A.M. 1994. *An Expanded Sourcebook - Qualitative Data Analysis*. 2nd ed. SAGE Publications.

Novak, J.D. 1993. 'How do we learn our lesson?: taking students through the process.' *The Science Teacher,* 60(3), 50-55.

Padgett, D.K. 1998. *Qualitative Methods in Social Work Research: Challenges and Rewards.* SAGE Publications.

Patton, M.Q. 1990. *Qualitative Evaluation and Research Methods.* 2nd ed. SAGE Publications.

Phillips, E.M. & Pugh, D.S. 1993. *How to get a PhD.* Open University Press.

Rosenhead, J. & Mingers, J. Eds 2001. *Rational Analysis for a Problematic World Revisited Problem Structuring Methods for Complexity. Uncertainty and Conflict.* 2nd ed. John Wiley.

Robson, C. 1999. *Real World Research.* Blackwell.

Scandura, T.A. & Williams, E.A. 2000. 'Research Methodology in Management: Current Practices, Trends, and Implications for Future Research.' *Academy of Management Journal,* 43 (6), 1248-1264.

Vose, D., 2000. *Risk Analysis. A Quantitative Guide.* John Wiley & Sons

Yin, R.K. 1994. *Case Study Research: Design and Methods.* 2nd ed. SAGE Publications.

References to Chapter 3

BPAmoco 1998. http://www.bpamoco.com/about/history (accessed 4 October 1999).

Drucker, P. 1999. 'Innovate or Die.' *The Economist,* 25 September.

Encarta 1999. © 1997-1999 Microsoft Corporation. http://encarta.msn.com/encarta (accessed October-December 1999)

Financial Times 2002. *Europe to set limit to high risk holdings.* 25 March.

Financial Times 2002. *Project finance market shrinks.* 13 February.

Grubb, S.R T. 1998. 'The Private Finance Initiative - Public Private Partnership.' *Proceedings Institute of Civil Engineers - Civil Engineering,* 126 (August), 133-140.

Haque, N. 1996. The Private Finance Initiative (PFI) - A theoretical and practical examination of the policy, and its potential to procure services in the Higher Education (university) sector. MBA Thesis, Imperial College.

Hollihan III, J.P. 1994. The evolution and future of BOT and alternative structures; advantages and disadvantages of BOT as a project finance mechanism. Paper presented at the Financial Times Conferences - International Infrastructure Finance, October. London.

Huang, Y.L. 1995. Project and policy analysis of build-operate-transfer infrastructure development. PhD thesis, University of California at Berkeley.

IFC 1999. *Project Finance in Developing Countries - Lessons from Experience: 7.* IFC.

Kerr, D. 1998. 'The Private Finance Initiative and the Changing Governance of the Built Environment.' *Urban Studies*, 35 (12), 2277-2301.

London Underground 1999. http:// londontransport.co.UK/lt/fact_02.htm (accessed 7 October 1999).

Meyer, A.G. 1999. *Communism.* Encarta Online © 1997-1999 Microsoft Corporation. http://encarta-msn.com/encarta/Art..sp?z=2&br=0&mod=1&pg=6&ti=05195000 (accessed 5 October 1999).

Overton, R.C. 1999. *Railroads in the United States.* Encarta Online © 1997-1999 Microsoft Corporation http://encarta.msn.com/encarta/prInternationalasp?z2&br=0%pg=8&ti018E3000&sc=17 (accessed 1 October 1999).

Park, T.K. 1998. 'Private Infrastructure Development in Asia.' *The Journal of Project Finance*, (Fall).

Peterson, W.C. 1999. *Capitalism.* Encarta Online © 1997-1999 Microsoft Corporation. http://encarta.msn.com/encarta/pri...=2&br=0&pg=8&ti=0623D000&sc=0&pt=1 (accessed 5 October 1999).

Plessa, M. 1998. The Private Finance Initiative Evolution Since 1992: The Northern Line Train Services Contract: a Successful PFI Project. MBA Thesis, Imperial College.

The Napoleon Foundation 1998. *The Suez Isthmus - The Joining of two Seas.* http://www.napoleon.org/index_html.html (accessed 28 September 1999).

Tiong, R.L.K., Yeo, K.T. & McCarthy, S.C. 1992. 'Critical Success Factors in Winning BOT Contracts.' *Journal of Construction Engineering and Management*, 118 (2), 217-228.

Urbanik, T. 1999. *History of Road Construction.* Encarta Online© 1997-1999 Microsoft Corporation. http://encarta.msn.com/encarta/prInternationalasp?z=2&br=0&pg=8&ti=003860000 & sc =19 (accessed 1 October 1999).

Virtual Economy 1999. Institute for Fiscal Studies ©1999 London. http://www.bidznet.bris.ac.UK/virtual/economy (accessed 15 October 1999).

Vives, A. 1997. Private Infrastructure - Ten Commandments for Sustainability. *2, IFM-304,* E.S. Ed. InterAmerican Development Bank – Sustainable Development Department.

Wang, S.Q., Tiong, R.L.K., Ting, S.K. & Ashley, D. 1999. 'Risk Management Framework for BOT Power Projects in China.' *The Journal of Project Finance*, Winter, 56-67.

Weisser, H.G. & Kislansky, M. 1999. *United Kingdom.* Encarta Online © 1997-1999 Microsoft Corporation. http://encarta.msn.com/encarta/pri...&br=0&pg=8&ti=007D3000&sc201&pn=3

Wolf, JR.C. 1988. *Markets or Governments: Choosing Between Imperfect Alternatives.* Cambridge, Massachusetts: The MIT Press.

References to Chapter 4

Beato, P. 1997. 'Road Concessions: Lessons learned from the experience of four countries - Best Practice Study.' *Inter-American Development Bank, Infrastructure and Financial Markets Publications.* IFM-110/97, E.

Broadbent, J. & Laughlin, R. 1999. 'The Private Finance Initiative' Clarification of a Future Research Agenda.' *Financial Accountability and Management*, 15 (2), 95-114.

Brown, C. 1999. 'UK Public Private Partnerships.' *International Financial Law Review*, July.

Christen, J. 2001. PFI in Germany – Can we and should we copy the British example?. Paper presented at the First European Infrastructure Congress - BuB-Workshop: PFI and public buildings, Frankfurt, January.

Cordova, P. 1994. Legal risk and dispute procedures - Contractual issues - Exit routes and procedures. Paper presented at the Financial Times Conferences: International Infrastructure Finance, London, October.

DETR 1999. *Summary of DETER public/private partnerships projects.* http //www.detr.gov.uk/ppp/2.htm (accessed 22 Nov 1999).

Eaton, D. 2000. Teaching notes of Salford University.

European Venture Capital Journal 1996. *Innisfree PFI fund targeting new asset class.* 45 (1), 12.

Financial Times 1999a. *NHS hospital to be rebuilt using £137m bond issue.* 11 August.

Financial Times 1999b. *International Capital Markets: Hospital operation injects life.* 11 August.

Financial Times 1999c. *Monetary Union boosts project finance: tight fiscal policy means governments cannot afford infrastructure spending and have to attract private funds.* 22 September.

Financial Times 1999d. *Top bid for £1bn schools PFI deal – Construction Miller group named favourite for Glasgow contract.* 3 November.

Financial Times 1999e. *Widespread use of capital markets to fund PFI projects is intensifying competition.* 19 November.

Grout, P.A. 1997. 'The Economics of Private Finance Initiative.' *Oxford Review of Economic Policy*, 13 (4), 53-66.

HM Treasury Taskforce 1998a. *Taskforce Guidance - Policy Statements - Public Sector Comparators and Value for Money.* February.

HM Treasury Taskforce 1998b. *Taskforce Guidance - Case Studies - Report on the Procurement of Custodial Services in DCMF prisons – 2 case studies.*

HM Treasury Taskforce 1997. *Taskforce Guidance - Partnerships for Prosperity.* November.

HM Treasury Taskforce 1999. *Taskforce Guidance - Technical Note n. 5 - How to construct a Public Sector Comparator.* October.

HM Treasury Taskforce 2000. *Taskforce Technical Note n. 6 - How to Manage the Delivery of Long Term PFI Contracts.*

HM Treasury Taskforce 1999. *Taskforce Guidance - PFI Standard Contract Guidance.*

HM Treasury 1993. Chancellor of the Exchequer addresses the Annual Dinner of the Scottish CBI in Glasgow, 9th September.

IAPMEI 1998. *O Sector da Construção: Diagnóstico e Eixos de Intervenção.* IAPMEI.

Jacobs K. 1998. 'Value for Money Auditing in New Zealand: Competing for Control in the Public Sector.' *British Accounting Review*, 30, 343-360.

Jury, J. 1999. 'Pioneer Innisfree Closes Second PFI Fund.' *UK Venture Capital Journal*, 1st June.

Kotler, P. 1999. *Marketing Management.* 10th ed. Prentice-Hall.

McDermott, P. & Charmer, K. 2001. Partnering within PFI projects. Paper presented at the conference The experience of PFI in the UK and Project Finance in Portugal, Lisbon, 19th January

Porter, M. 1985. *Competitive Advantage; Creating and Sustaining Superior Performance.* Free Press.

Project Finance 1999. *Eurobond programme offers hope to small PFI deals.* August.

Stanton-Ife, P. 1999. Development a market for infrastructure finance. Paper presented at the conference Financing Infrastructure for Europe, Nicosia, 20-21 October.

Vives, A. & Beato, P. 1996. 'How much equity is enough in project financing?.' *Inter-American Development Bank, Infrastructure, Financial Markets Bulletin,* February.

Wells, L.T. 1999. 'Private Foreign Investment in Infrastructure: Managing Non-Commercial Risk.' *Private Infrastructure for Development: Confronting Political and Regulatory Risks,* Rome, 8-10 September.

Wilson, T. 1999 Financing infrastructure for Europe PFI/PPP: The design, finance and operate model. Paper presented at the conference Financing Infrastructure for Europe, Nicosia, 20-21 October.

References to Chapter 5

Akintoye, A, Taylor, C. & Fitzgerald, E. 1998. 'Risk Analysis and Management of Private Finance Initiative Projects.' *Engineering Construction and Architectural Management*, 5 (1), 9-21.

Bernstein, P.L. 1998. *Against the Gods: The remarkable Story of Risk.* John Wiley & Sons, New York.

Bessis, J. 1998. *Risk Management in Banking.* John Wiley & Sons Ltd.

Boothroyd, C. & Emmett, J. 1996 *Risk Management - A Practical Guide for Construction Professionals.* Witherby & Co Ltd.

Bubnova, N. 1999. 'Guarantees and Insurance for Re-Allocating and Mitigation Political and Regulatory Risks in Infrastructure Investment: Market Analysis.' *Proceedings of the Private Infrastructure for Development: Confronting Political and Regulatory Risks Conference,* 8-10 September, Rome, Italy.

Cooper, D. & Woo. 1988. 'Entrepreneurs Perceived Chances for Success.' *Journal of Business Venturing*, 3, 97-108.

Cordova, P. 1994. Legal risk and dispute procedures – Contractual issues - Exit routes and procedures. Paper presented at the *Financial Times Conferences – International Infrastructure Finance*, London, October.

Covello, V.T. & Merkhofer, M.W. 1993. *Risk Assessment Methods - Approaches for Assessing Health and Environmental Risks.* Plenum Press, New York.

Edwards, P.J. & Bowen, P.A. 1998. 'Risk and Risk Management in Construction: A Review and Future Directions for Research.' *Engineering Construction and Architectural Management,* 5 (4), 339-349.

Encarta Dictionary 2000. Encarta Online © 1997-1999 Microsoft Corporation. http://dictionary.msn.com/find/entry.asp?search=risk (accessed 18-10-2000).

Financial Times 2002. *PFI hospital move attacked as 'political fix'.* 19th March.

Ghosh, D. & Kay, M.R. 1997. Risk, Ambiguity and Decision Choice: Some Additional Evidence.' *Decision Sciences*, 28 (1), Winter, 81-104.

HM Treasury Taskforce 1999. *Taskforce Guidance - Technical Note n. 5 - How to construct a Public Sector Comparator.* October.

IFC 1999. *Project Finance in Developing Countries - Lessons from Experience: 7.* IFC.

Klir, G. & Folger, T. 1988. *Fuzzy Sets. Uncertainty and Information.* Prentice Hall, New Jersey.

Mobsby, J.F. 1994. Constructing and packing a bid to maximise competitive advantage. Paper presented at the *Financial Times Conference on BOT*, London.

Morgan, M.G. & Henron, M., 1990. *Uncertainty: A Guide to Dealing with Uncertainty in Quantitative Risk and Policy Analysis.* Cambridge University Press.

Morgan, R.I. 1999. Management of staff issues – The government perspective – Treasury Taskforce. Paper presented to the Conference Financing Infrastructure for Europe, Nicosia, 20-21 October.

National Audit Office 2001. *Managing the relationship to secure a successful partnership in PFI projects.*

Padgett, D.K. 1998. *Qualitative Methods in Social Work Research: Challenges and Rewards.* SAGE Publications.

Peters, E.E., 1999. *Patterns in the Dark: Understanding Risk and Financial Crisis with Complexity Theory.* John Wiley.

PRAM 1997. *Project Risk Analysis and Management Guide.* ed. By Simon, P. Hillson, D. & Newland, K. High Wycombe, United Kingdom.

Raftery, J. 1994. *Risk Analysis in Project Management.* E & FN Spon, London.

Rocheleau, B 1999. 'Government Information System Problems and Failures: a Preliminary Review.' *Public Administration and Management* (http://www.pamj.com/roche.html - accessed 18/8/99).

Smith, N.J: 1999. *Managing Risk in Construction Projects.* Blackwell Science, Oxford, UK

Tam C.M. 1999. 'Build-operate-transfer model for infrastructure developments in Asia: reasons for success and failure.' *International Journal of Project Management*, 17 (6), 377-382.

Wells, L.T. 1999. Private Foreign Investment in Infrastructure: Managing Non-Commercial Risk. *Proceedings of the Private Infrastructure for Development: Confronting Political and Regulatory Risks Conference,* 8-10 September, Rome, Italy.

West, G.T. 1999. 'Political Risk Investment Insurance: A Renaissance.' *The Journal of Project Finance,* Summer, 27-36.

Williams, C.A., Smith, M.L. & Young, P.C. 1998. *Risk Management and Insurance.* 8th ed., Irwin/McGraw-Hill International Editions.

Yeo, K.T. & Tiong, R.L.K. 2000. 'Positive management of differences for risk reduction in BOT projects.' *International Journal of Project Management,* 18, 257-265.

Zadeh, L. & Kacprzyk, J. 1992. *Fuzzy Logic for the Management of Uncertainty.* John Wiley & Sons.

References Chapter 6

Aaker, D. 1992. *Strategic Market Management.* 3rd ed., John Wiley, New York.

Ackerman, F. 2001. Tutorial presented at the Advanced Decision Explorer Workshop, London, 5 July.

Bana e Costa, C.A., Ensslin, L., Corrêa, E.C. & Vansnick, J.C. 1999. 'Mapping critical factors for firm sustainable survival. A case-study in the Brazilian textile industry', in *Decision Support Systems for Sustainable Development.* eds G. Kersten, Z. Mikolajuk & A. Yeh, Kluwer Academic Publishers, Dordrecht, 197-213.

Banxia 1998-99. *An Introduction to Decision Explorer – Workbook 1.* Banxia Software, London.

Belassi, W. & Tukel, I. 1996. 'A New Framework for Determining Critical Success / Failure Factors in Projects.' *International Journal of Project Management.* 14 (3), 141-151.

Belout, A. 1998. 'Effects of Human Resource Management on Project Effectiveness and Success: Toward A New Conceptual Framework.' *International Journal of Project Management* 16 (1), 21-26.

Brannback, M. 1996. Strategic decisions and decision support systems. PhD Thesis, Abo Akademi, Finland.

Brightman, J. 2000. 'What's in a name? Cognitive mapping, mind mapping, concept mapping. Banxia Software 2000', in *Insights into Qualitative Data Analysis.* Scolari, USA.

Bullen, C.V. & Rockart, J.F. 1981. 'A primer on Critical Success Factors.' *Sloan WP n. 1220-81*, Sloan School of Management, MIT.

Chaib-Draa, B. & Deshairnais, 1998. 'A Relational Model of Cognitive Maps.' *International Journal of Human Computer Studies*, 49, 181-200.

Chaib-Draa, B. 2002. 'Cognitive Maps: Theory, Implementation and Practical Applications in Multiagent Environments.' *IEEE Transactions on Knowledge and Data Engineering* (forthcoming).

Chan, A.C., Ho, D.C.K. & Tam, C.M. 2001. 'Design and Build Project Success Factors. Multivariate Analysis.' *Journal of Construction and Engineering Management,* March-April, 93-100.

Chua, D.K.H., Kog, Y.C. & Loh, P.K. 1999. 'Critical Success Factors for Different Project Objectives.' *Journal of Construction Engineering and Management,* May-June, 142-150.

Dawson, P.J. 1997. A Hierarchical approach to the management of construction project risk. PhD Thesis, University of Nottingham.

Donnelly, J. H., Gibson, J. & Ivancevich, J. 2000. *Administração: Princípios de Gestão Empresarial.* Translation of *Fundamentals of Management.* 10th ed. McGrawHill.

Eden, C. 1992. 'On the Nature of Cognitive Maps.' *Journal of Management Studies,* 29, 261-265.

Eden, C. & Ackerman, F. 1992. 'The Analysis of Cause Maps.' *Journal of Management Studies*, 29, 309-324.

Eden, C. & Ackerman, F. 1998. *Making Strategy – The Journey of Strategic Management.* SAGE Publications.

Eden, C. & Simpson, P. 1989. *SODA (Strategic Options Development and Analysis) and Cognitive Mapping in Practice - Rational Analysis for a Problematic World.* ed J. Rosenhead, John Wiley & Sons.

Financial Times 1999. *Survey: Knowledge Management – An Essential Ingredient of Success.* 12th April.

HM Treasury Taskforce 2000. *Taskforce Technical Note n. 6 - How to Manage the Delivery of Long Term PFI Contracts.*

Jones, G. George, J. & Hill, C. 2000. *Contemporary Management.* 2nd International Ed., McGrawHill.

KPMG Management Consulting 1998. Knowledge management. Research Report. http://www.sap.com/uk/cityofe/pages/kmglossary.html (accessed 26/11/1999).

Ozdoganm, I.D., & Birgonul, M.T. 2000. 'A Decision Support Framework for Project Sponsors in the Planning Stage of Build-Operate-Transfer (BOT) Projects.' *Construction Management and Economics,* 18, 343-353.

Peters, E.E. 1999. *Patterns in the Dark: Understanding Risk and Financial Crisis with Complexity Theory.* John Wiley.

Rockart, J. 1979. 'Chief Executives Define their Own Data Needs.' *Harvard Business Review,* Mar-Apr, 81-92.

Stewart, R.W. & Fortune, J. 1995. 'Applications of Systems Thinking to the Identification, Avoidance and Prevention of Risk.' *International Journal of Project Management,* 13(5), 279-286.

Tiong, R.L.K., Yeo, K. & McCarthy, S.C. 1992. 'Critical Success Factors in Winning BOT Contracts.' *Journal of Construction Engineering and Management,* June, 217-228.

Wang, S.Q., Tiong, R.L.K., Ting, S.K. & Ashley, D. 1999. 'Political risks: Analysis of Key Contract Clauses in China's BOT Projects.' *Journal of Construction Engineering and Management,* May-June, 190—197.

References to Chapter 7

Jones, G., George, J. & Hill, C.W.L. 2000. *Contemporary Management.* 2nd International Ed., McGraw Hill.

Kahkonen, K, & Huovila, P. 1996. 'Systematic risk management in construction projects.' http://web.bham.ac.uk/d j.crook/lean/iglc4/huovila/risk2.htm. (accessed 5/11/1999).

References to Chapter 8

Campbell, A. 1999. Key issues for the UK's Private Finance Initiative. Paper presented to the conference Financing Infrastructure for Europe, Nicosia, 20-21 October.

Financial Times 1999. *Siemens has seen its payments reduced for under-performance of the computer system installed in the Immigration Service and Passport Agency.* 24 August.

McDonald, M. & Dunbar, I. 1998. *Market Segmentation – How to do it, How to profit from it.* 2nd ed. McMillan Press Ltd.

Porter, M. 1999. *The Competitive Advantage of Nations.* The MacMillan Press Ltd, London.

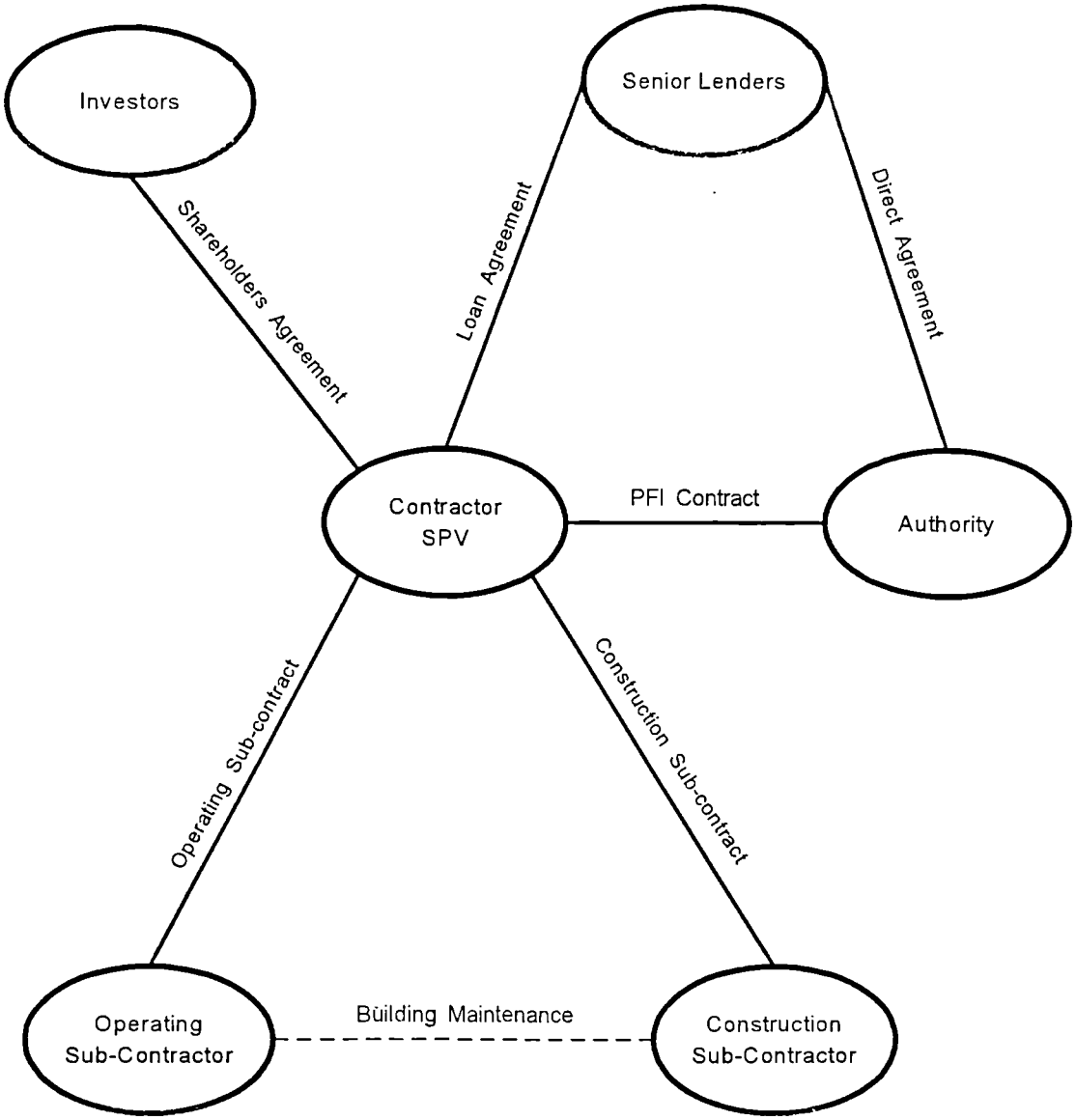
Project Finance 1999. *Eurobond programme offers hope to small PFI deals.* August.

ANNEX I
CASE STUDY PROTOCOL

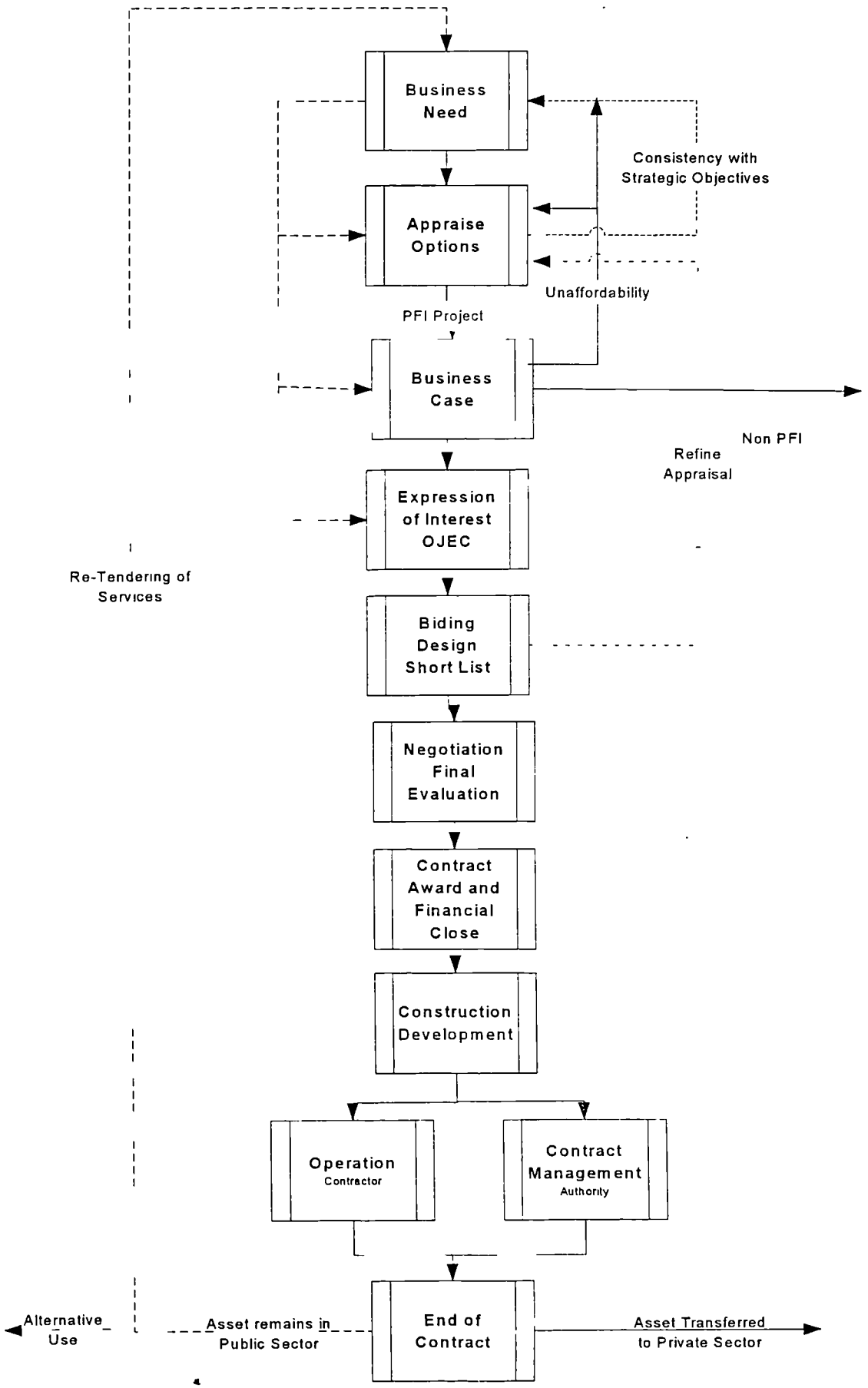
Case Study Protocol - Index

[1] Adapted by author and David Eaton from a Model from the Infrastructure Finance Directory.

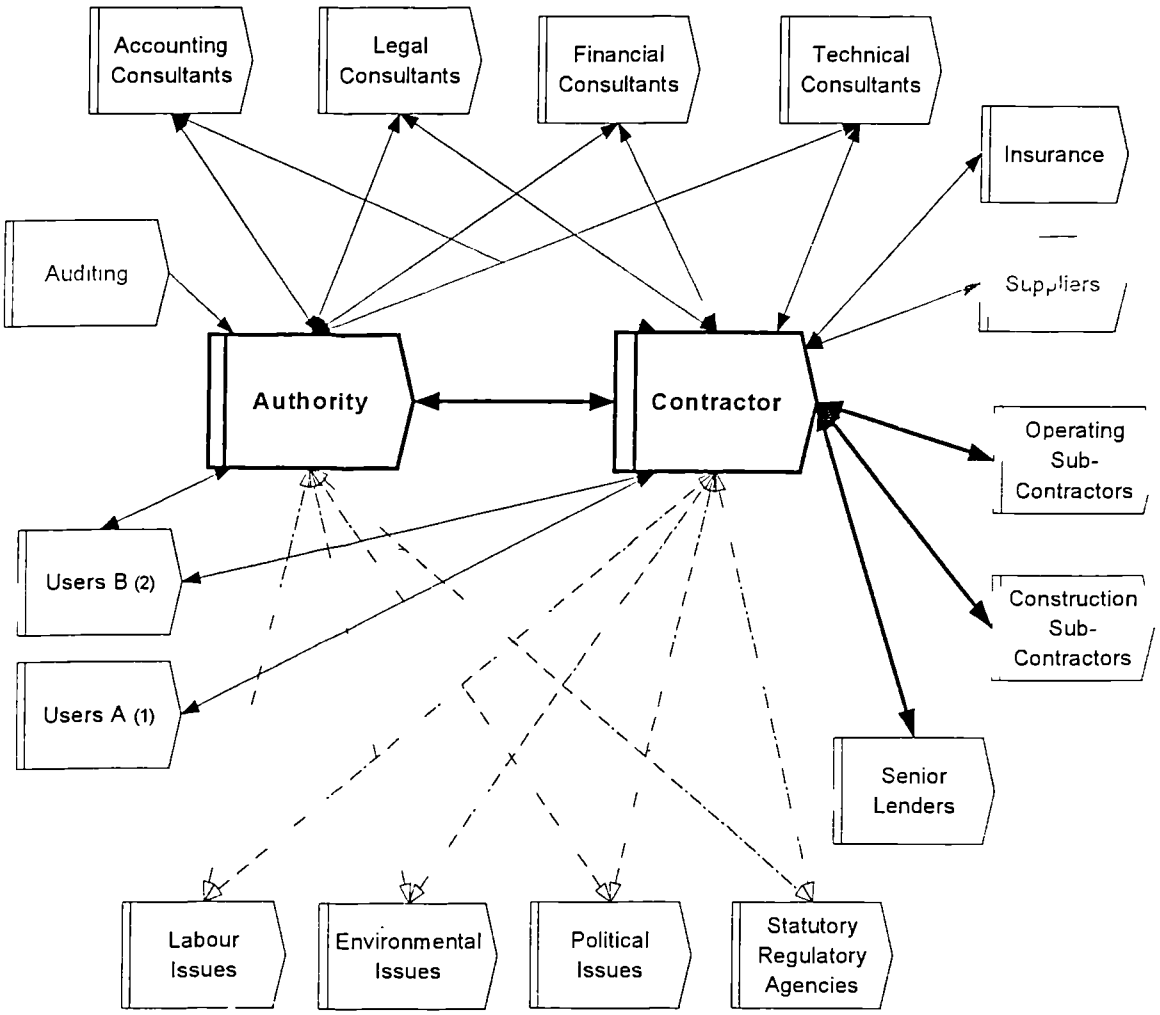
The Contracts in a PFI

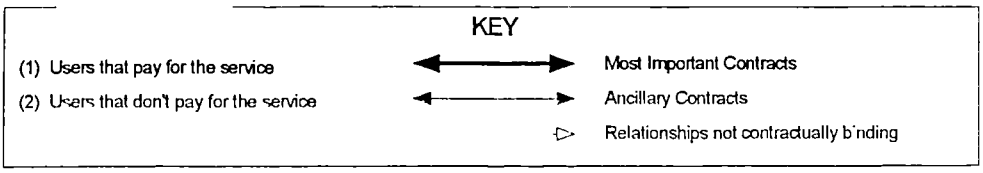


PFI - Life Cycle



PFI - Value-Delivery Network





Interview Guide

I - Field Visit Procedures

Initial Scheduling of Field Visit

Review of Preliminary Information

Special Documents

Persons to be Interviewed (and other sources of information)

II - Outline of Individual Case Study Reports

II.1 Descriptive Information

Explanatory Information

II.2 – What is the model for sustainable competitive advantage in PFI?

Topics

Factors for Competitive Advantage - Innovation, Quality, Efficiency, attention to the client

Assessment Techniques - Risk Management, Benchmarking, Client satisfaction, knowledge management and market studies

Summary of questions

- PFI improves Innovation?
- PFI improves Quality?
- PFI improves Efficiency?
- PFI improves Attention to the client?

II.3 What are the CSF in PFI?

Topics

Theory of CSF

Mind Mapping (Decision Explorer)

Summary of questions

- Mind Map Concepts and relationships

II.4 What is the model for risk management?

Topics

Theory of Risk Management

Fuzzy Sets

Summary of questions

- Fill Table – Membership Grade (attached) or/and
- Draw Uncertainty Evolution

Membership Grades of Uncertainty according to the type of risk and stage of life cycle of a PFI

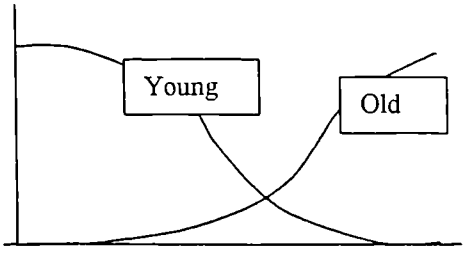
1- To assign membership grades to the start and end of each stage. If the line is not straight draw the line in-between (a blank char is attached)
2- To assign to each type of risk the Relative Importance (weight 1,2,3.4,or 5).

Type of Risk Relative Importance		Business Need MG at Beg* End	Bidding / Design MG at Beg* End	Construction MG at Beg* End	Operation / Maintenance MG at Beg* End **
	Bidding				
	Commercial				
	Construction				
	Design				
	Economical/ Financial				
	Force Majeure				
	Human				
	Legal				
	Operation/ Maintenance				
	Political				
	Residual Value				
	Social				

* Membership grade at Beginning and End of Stage **End of Project

Membership Grades (MG) - It is important to realize that membership grades are not probabilities. The summation of probabilities must equal 1, while there is no such requirement for MG. A value is assigned to each element of the universal set signifying its degree of membership. An example of MG is presented in the following table

Ages	Infant	Adult	Young	Old
5	0	0	1	0
10	0	0	1	0
20	0	.8	.8	.1
30	0	1	.5	.2
40	0	1	.2	.4
50	0	1	.1	.6
60	0	1	0	.8
70	0	1	0	1



ANNEX II

CASE STUDY

LUSOPONTE

PRIVATE FINANCE INITIATIVE (PFI)

CASE STUDY

LUSOPONTE

Teresa de Lemos

Vasco da Gama Bridge over River Tagus

LUSOPONTE

Project Synopsis

Title – Lusoponte - Tagus River Crossings – Construction and Operation of Vasco da Gama Crossing, Operation of the 25th April Crossing and the pre-feasibility study of a 3rd Crossing.

Country – Portugal.

Project Cost - 170 billion Escudos ($1.1 billion) initial cost, plus 24 billion Escudos refinancing in July 2000.

Sector – Transport.

Status - Operating. Finance Agreement closed July 1994. Took over operation/management of 25th April crossing on the 1st January 1996. The Vasco da Gama crossing opened to traffic 29th March 1998.

Sponsors - Concessionaire/Lead Manager – Lusoponte – A special joint venture consortium of Portuguese, French and UK companies.

Purchaser - Portuguese Government.

Financing Package - European Union Cohesion Fund: 64 billion escudos (35.0%); European Investment Bank (EIB) Loan: 23 billion escudos in Deutsche Marks (13.0%) and a further 37 billion in Escudos (20.0%); Existing revenues from the 25th April Crossing: 10 billion escudos (6.0%); Others (shareholders, government grants, etc.): 46 billion escudos (26.0%).

Special Features - Access to long-term (maturing in 30 years) EIB funding. Partially financed by the revenues of the existing 25th April crossing.

Brief - The Concession Agreement, dated 24th March 1995, awards the design, construction and financing of the Vasco da Gama Crossing, plus the operation and maintenance of both the new and the existing 25th April Crossings. The concession was originally to expire at the earliest of 24th March 2028 or a total cumulative traffic flow of 2,250 million vehicles. Included in the Concession is the exclusivity of operation of all road crossings across the Tagus (excluding river crossings by boat, rail or air) downstream from Vila Franca de Xira, (25 Km from Vasco da Gama). To settle all pending disputes and claims a Global Settlement Agreement (GSA) was signed on the 3rd July 2000, that extends and establishes the concession expiry as 24th March 2030, irrespective of the number of crossings, and includes the additional obligation for Lusoponte to undertake pre-feasibility studies for a 3rd crossing over the Tagus.

Vasco da Gama Crossing

The 17.2 Km toll crossing is the longest ever built in Portugal[1], second in Europe only to Eurotunnel, and the longest river crossing in Southern Europe. It carries traffic across 10 km of water over the Tagus estuary and 8 km of land. The viaducts [2] account for 12 Km, the rest of its length being approach roads. It includes a cable-stayed bridge with a suspended section, 31 metres wide, 830 metres long, and a shipping channel 47 metres high, near the Lisbon side. As of 1999, the Annual Average Daily Traffic was about 41 thousand vehicles, and the yearly crossings totalled 15 million. For 2000, it is expected a total of around 19 million crossings (a 30% increase).

The crossing was named after the famous Portuguese navigator of the 15th and 16th century, Vasco da Gama, on the 500th anniversary of his discovery of the sea route to the Indies around the Cape of Good Hope in 1498.

It forms an important link with Lisbon's new northern and southern highway systems, completing the road network around the city. On the north shore, at Sacavem (adjacent to Lisbon) the crossing links with A1 motorway to the North, the CRIL (Lisbon Internal Ring Road) and the EN10 Variant interchanges. The south interchange, near Montijo, joins the A12 motorway and the IC13 Coina Regional Ring Road, providing easy access to the Setúbal Peninsula, Spain and the Algarve.

The Vasco da Gama Crossing runs through one of the ten most important wetlands in Europe - 400 hectares of the Samouco Salt Pan classified as a Special Protected Area under European Law. It is an important breeding ground for a number of protected bird species such as the Black Winged Stilt (*Himantopus himantopus*), the Little Tern (*Sterna aibifrons*), and the Kentish Plover (*Charadrius alexandrinus*).

Lusoponte's role was to expropriate and recover the area of the salt pans that are public property and be given back to the public sector now that the recovery is completed. The Government has to create the Foundation of the Samouco Salt Pans (Lusoponte will be part of it) that will ensure its management and promote programs of environmental education (environmental workshop). [3]

As part of the commitments agreed and following recommendations of the EIS, Lusoponte created the Environmental Monitoring Study Centre (CEMA) that monitors and does surveillance work in conjunction with external consultants. The various disciplines continuously studied by these experts include the socio-economic impact, the water and air quality, flora and fauna, bird life, marine life, archaeology, and noise levels.

The environmental aspect of the project has created widespread interest and this is met by a full colour quarterly informative newsletter published by CEMA on the progress of the project which is sent to schools, universities, municipalities and other interested organisations. A Visitors

[1] Lusoponte, http://www.lusoponte.pt (accessed 17-01-2000).
[2] Lisbon Bridges, http:///www.personal.u.net.com/~luso/bridges.htm (accessed 16-10-2000).
[3] The Salinas were a victory for the environmentalists. There were some local authorities in Alcochete that considered the Salinas was a waste of land since it could be developed for construction (Prof. Dr. João Gomes Ferreira, UNL, Interview 14 June 2000). Lusoponte repaired the dams and the accesses, cleaned the paths and fenced the area.

Centre, where the project is presented through graphic displays, video, and lectures, had attracted some 2,200 people by the end of 1996 including journalists, students, professional engineers, and politicians from numerous countries.

Near the toll plaza there is a small museum where stones carved by Neanderthal men are displayed. In the area now occupied by the tollbooths there was a "factory" of flakes. The carved stones - Bifaces, side scrapers, points & knives - are less than 30 thousand years old, confirming Neanderthal presence in a later period than expected.

25th April Crossing

Opened in 1966, this toll suspension bridge is very similar in appearance to the Golden Gate Bridge in San Francisco. It is 2,278 metres long, and leaves Lisbon at high level above Alcântara and makes landfall at Almada on the southern bank of the river. Its centre span, of 1,012 metres was the longest central span of any European suspension bridge when built. However, both the more recent Humber Bridge (UK) and Bosphorus Bridge are now longer. The bridge crosses the Tagus at a height of 70 metres and its foundations, 79 metres deep into basalt rock, were also a world record at the time of their sinking. The deck currently has six traffic lanes.

It operates at near full capacity, and at peak times, queues can be enormous. By 1999, the AADT was 149 thousand vehicles, totalling 54.5 million crossings per annum. In 2000, it is expected an annual traffic increase at around 4 percent.

In June 1999, Fertagus inaugurated a heavy railway – dual track double deck service - under the bridge. This was a separate concession agreement from Lusoponte.

1. BACKGROUND – HISTORY AND OBJECTIVES

1.1. HISTORICAL BACKGROUND

In 1991, only the 25th April road crossing connected Lisbon on the Tagus's north bank to the south bank. The nearest crossing over the Tagus was in Vila Franca de Xira approximately 40 Km upstream from the river mouth.

A second crossing was a vitally needed infrastructure in order:[1]

- To solve the serious traffic congestion on the 25th April Crossing;[2]
- To detour national and international heavy traffic travelling in the axis North-South from Lisbon city centre;[ibid]
- To develop the Tagus south bank - relieving the urban pressure in Lisbon and developing new industrial projects;
- To improve links between Spain and Portugal;[3]
- To create a new north-south link [ibid]

And was facilitated by:

- The availability of structural funds to integrate the crossing into the TransEuropean Network Project (European Union Cohesion Fund);
- The need to improve access to the World Exhibition Expo98 site and, to promote its future urban development;
- Favourable socio-economic indices – The most important was the increase in number of vehicles per 1000 inhabitants – in the Lisbon area it increased from 258 in 1990 to 421 vehicles per 1000 inhabitants in 1998, and in Setubal (south bank) the increase was from 147 to 319 vehicles per 1000 inhabitants. There was also an increase of 8-9% in commercial vehicles.

In January 1991, the Portuguese Government, created GATTEL (Gabinete da Travessia do Tejo em Lisboa), a governmental agency under the Ministry of Public Works

[1] *Lusoponte* 2000, paper presented to INA – G.P.S.P., Lisbon, 9 May.
[2] EIA, GATTEL/Lusoponte/Coba, 1994.
[3] Proposal to the Cohesion Fund and Dec-Lei that creates GATTEL.

(MOPTC), with links to the Ministry of Environment (MARN) and the Ministry of Planning (MPAT), to conceive a new road crossing over the Tagus estuary and decide its location. In 1994, by the Dec-Lei 76/94 GATTEL's duties were further extended to co-ordinate and control the procedures required to promote the construction and operation of the Vasco da Gama crossing as a private concession.

In September 1991, GATTEL[4] concluded a series of studies, discarding the tunnel solution and comparing three corridors: eastern (Sacavem Montijo), central (Chelas Barreiro) and western (Algés Trafaria). By then, no Environmental Impact Assessment (EIA) had been conducted. After a while only two options remained for consideration:

- Road bridge Sacavem-Montijo, complemented by a new heavy rail track on the existing bridge, linked to a strategy of opening new urban development fronts, priority to roadways and individual transport. This alternative was defended by MOPTC and the municipalities of Montijo and Alcochete;
- Combined Road and Railway bridge Chelas-Barreiro, complemented by a new a light railway track on the existing bridge, linked to a strategy of urban zoning, integrated perspective of land use management and transportation, and priority to public transport. This alternative was defended by MPAT; MARN, by the planning office and consultants of GATTEL, by the Regional Land Use Plan for the Metropolitan Area of Lisbon, by the municipalities of Almada, Barreiro, Seixal and Moita, and also by the preliminary EIA of the two alternatives.

In July 1992, the MOPTC approved the Sacavem-Montijo crossing despite the opposition from planning departments and environmental organisations, probably assuming that the location for the new airport in Lisbon would be Rio Frio on the southern bank of the Tagus. The international competitive tender for the concession was then launched

[4] Joanaz-de-Melo, J., *The new bridge over the Tagus Estuary or how not to develop a project*, http://despodata.pt/geota/ingles/newbridg.htm (accessed 7-06-2000).

2. THE BIDDING PROCESS

2.1. CHRONOLOGY OF KEY EVENTS

9th January 1991	Dec-Lei 14A/91 the Portuguese Government creates GATTEL
15th November 1991	Selection of preferred corridor route
September 1992	Final decision on the selection of the Sacavem- Montijo corridor
October 1992	International BOT tender. Pre-qualification
March 1993	Selection of three consortia to present a proposal
December 1993	Direct negotiations starts. Two consortia were short-listed: Tejoponte led by Bouyges and Lusoponte led by Kvaerner and Campenon Bernard SGE
13th April 94	Preferred Bidder - Agreement for negotiation with Lusoponte, after pre-selection
19th April 94	Ministerial Dispatch
15th June 1994.	Dec-Lei 168/94 DR IA, 136/94 – approves the basis for the concession and awards it to Lusoponte
June 1994	The Government was unable to implement the contractual toll increase on the 25th April Crossing due to violent public reactions.
	The Government submitted the project to the Cohesion Fund, and the European Commission conditioned the availability of funds to the existence of an approved EIA (influenced by the Commissioner Wulf-Mathies)
17th June 1994	Resolução do Conselho de Ministros 13/94 DR II, 138/94, Interim Agreement
30th June 1994	EIA conducted by the concessionaire was concluded and sent for approval of MARN via GATTEL
28th July 94	Finance agreement
6th October 1994	End of public consultation period on EIA
3rd November 1994	EIA study approved by MARN (Cohesion Fund) and sent to Bruxells
15th December 1994	Resolução do Conselho de Ministros 121-A/94, DR IB 288/94 Approves the second concession contract
31st January 1995	Creation of Gestiponte- Operação e Manutenção das Travessias do Tejo, S.A. - Operation and maintenance operator
February 1995.	EIA approved by the European Commission
24th March 1995.	Financial close[5], 2nd contract and project contracts between Lusoponte and the Portuguese Government
July 1995	Construction started five months behind schedule (it was planned for February 1995 but was delayed due to the need of EIA approval)
1st January 1996	Gestiponte begins operation and maintenance of 25th April crossing.
15th July 1996	Protocol signed between the EU and the Portuguese State defining the pre-conditions that need to be satisfied for further release of EU funds, following an EU commission investigation on allegations of violations of the EIA by various environmental groups
28th March 1998	GATTEL and Lusoponte signed an Inspection Report for the Vasco da Gama crossing enabling it to be opened to traffic
29th March 1998	Open to traffic before schedule
3rd July 2000	Global Settlement Agreement (GSA) and draft Global Financial Rebalancing Agreement (GFRA)

[5] The date at which all the conditions precedent to the effectiveness of the lenders' commitments have been satisfied or waived.

2.2. PROJECT MANAGEMENT

2.2.1. Project Team

Initially, the project team of Lusoponte had three main areas: Finance, Operation/ Maintenance (O/M) and Design/Construction (D/C). The O/M was very small, and its function was to check the functionality of design to future O/M actions, the Design/Construction was by far the largest. At the peak of construction (October 96), there were 3300 people involved, with 14 different nationalities[6]. When construction was completed the D/C disappeared and the O/M team increased in size and importance.

2.3. NEGOTIATIONS

In October 1992, the international competitive tender for the concession was launched and eight consortia[7] expressed their interest (pre-qualification stage):

1. GTM (France), Engil, Opca, Sopol (Portugal), Amec (UK), Dumez (France), John Laing (UK)
2. Trafalgar House (UK), Campenon (France), BPC, Edifer, Hagen, Mota, Somague and Teixeira Duarte (Portugal)
3. Andrade (Brazil), Agroman (Spain), A. Ribeiro, Tamega, M.da Maiaand Zagope (Portugal)
4. Bouyges (France) Dragados (Spain), Soares da Costa (Portugal), Gogefar (France) R.Rosa and Soconstroi (Portugal)
5. Tarmac (UK), H.Beton (Netherlands) P.Holzman (Denmark)
6. Cubiertas, Entrecanales, Fomento(Spain)
7. Condotte, Ferrocemento, ICLA, Bonifica, Autostarde, Recchi S.di Messina (Italy)
8. Balalst (Netherlands), T.Woodrow (UK), Hojgaard ,Skanska (Sweden), Somec, SETH, A.Veiga (Portugal)

[6] 'Os que fizeram a ponte', *Expresso,* 21 March 1998.
[7] Mello, R. F., 1999, A perspectiva Empresarial de um Project Finance, paper presented to the Conference on Project Finance, Lisbon, November.

Out of the eight consortia five pre-qualified namely:

1. Travessia Rodoviária do Tejo –TRT (Lusoponte) led by Kvaerner and Campenon Bernard SGE
2. Pontejo led by Bouyges
3. Consórcio Europeu para a Ponte sobre o Tejo
4. Tarmac, HBW, Hollzman
5. Europonte

Of these, three presented a proposal: Lusoponte, Pontejo and the Consórcio Europeu para a Ponte sobre o Tejo. In December 1993 - The first two - Lusoponte and Pontejo were short-listed for direct negotiation with the Government. Some members of the third consortium integrated with the other two.

Throughout the negotiation process there was strong political and diplomatic activity surrounding the negotiations. Lusoponte had a strong British influence through Trafalgar House, and Pontejo had a strong French influence as it was led by Bouyges and had Hidroprojecto owned by the French Lyonnaise des Eaux as a member of the consortium.

During the negotiations the British Embassy in Portugal lobbied strongly for Trafalgar House and from the French side Jacques Chirac invited the Portuguese Prime Minister Cavaco da Silva for a special visit.

The future concessionaire Lusoponte had to complete, prior to the signing of the contract, several studies, or agreements:

- For Project Analysis;
- For Consultants selection;
- A Financial Options Paper – Financing Model, Risk Takers vs. Funding Sources, Discussion and approval;
- To Define the Financing Strategy: Rating of project for Capital Market (Offering circular, Road Show, Pricing) or Bank Market (I.M., Term Sheet, Negotiations);

- To Abide by the Conditions Precedent[8] established between Lusoponte and the Banks.

2.4. DUE DILIGENCE

The legal Due Diligence was completed before final signing of contract by the banks to ensure that all contracts accord with the Portuguese and UK law. Of all the contracts – concession, warranties, intercreditor, etc – only the security agreement has to be in accordance with the Portuguese law. This is a crucial contract for the banks because it is the warranty against their financing and all assets given as a warranty are in Portugal and the disputes must be ruled in a Portuguese Court. Given the intricacies of Portuguese law sometimes it is difficult to adapt the contract to UK law. The reverse is not true. All the other contracts are usually drafted according UK law, and are easily accepted.

[8] Conditions precedent are effectively a check list of documents the lenders require as the basis for their financing, and when they are satisfied the lenders are obliged to advance funds.

3. THE CONCESSION

3.1. MAIN PARTICIPANTS

3.1.1. Authority

GATTEL an autonomous entity set up under the Ministry of Public Works, with links to the Environment and Planning Ministries.

3.1.2. Contractors - SPV

Lusoponte, a consortium of Portuguese, French and British companies. The original shareholders were:

- **Kvaerner Construction International Ltd** (formerly Trafalgar House Construction Special Projects);
- **Campenon Bernard SGE** of France and part of Vinci Construction[9], part of the Vinci Group that has three other business areas: Vinci Concessions, which is the largest car park operator in France and has 1200 Km of motorways concessions and several other concessions, Vinci Energies-Information and Vinci Routes.

and six Portuguese construction contractors:

- **BPC** - *Bento Pedroso Construções SA*,[10] part of the Odebrecht Organisation, the 5th largest Brazilian private group, has four business areas: Engineering & Construction, Chemicals & Petrochemicals and Infrastructure & Public Services, and a Pulp Manufacturing Venture;
- **Mota & Companhia, SA**, the main activities are building of motorways, highways, airports, dams and dredging works;
- **Somague** [11]- *Sociedade de Construções* SA, one of the leading companies in Portugal undertaking public infrastructure projects;

[9] http://www.groupe-vinci.com (accessed 8-11-2000)
[10] http://www.bpc.pt (accessed 8-11-2000)
[11] http://www.somague.pt (accessed 8-11-2000)

- **Teixeira Duarte** - *Engenharia & Construções* SA, has been engaged in large scale public infrastructure for over 70 years;
- **Sociedade de Construções H Hagen SA**;
- **Edifer** - *Construções Pires Coelho & Fernandes* SA. has been engaged in large public infrastructure projects for over 26 years.

In 1999, Kvaerner Corporate Development Limited, sold its shares in Lusoponte to **Macquarie Infrastructure Group (MIG)**[12], which is managed by Macquarie Bank, and is one of the world's largest owners of toll roads.

In July 2000, the shareholding structure was as follows:

Macquarie Infrastructure Ltd *(UK)*	23.80%
Campenon Bernard SGE *(Vinci Group, France)*	22.00%
Bento Pedroso Construções SA *(Odebrecht, Brazil)*	14.84%
Mota & Companhia	13.83%
Somague – Engenharia SA	13.83%
Teixeira Duarte Engenharia & Construções SA	7.50%
Sociedade de Construções H. Hagen SA *(Vinci Group, France)*	2.80%
Kvaerner Construction Ltd *(UK)*	1.00%
Edifer Construções Pires Coelho & Fernandes SA.	0.40%

Note: The changing shareholding structure reflects the phases of the project. Pre Service Commencement there was a clear majority of construction competences, after the O/M competences become prevalent with the Macquarie and Vinci Group. (In reality, it was not a pre-determined strategic move - Kvaerner went through a series of financial difficulties and had to sell its participation in Lusoponte and it made sense to sell it to an experienced operator).

[12] http://www.macquarie.com.au/mig (accessed 8-11-2000)

3.1.3. Construction Sub-Contractor

Novaponte - Agrupamento para a Construção da Segunda Travessia do Tejo, ACE. Lusoponte's original shareholders formed a separate consortium led by Campenon Bernard SGE, which was responsible for the design, construction, and completion of the new bridge.

The shareholding structure was as follows:

Kvaerner Construction Ltd *(UK)*	23.00%
Campenon Bernard SGE *(Vinci Group, France)*	18.00%
Bento Pedroso Construções SA *(Odebrecht, Brazil)*	14.34%
Mota & Companhia	13.33%
Somague – Engenharia SA	13.33%
Teixeira Duarte Engenharia & Construções SA	9.00%
Sociedade de Construções H. Hagen SA, *(Vinci Group)*	5.00%
Edifer Construções Pires Coelho & Fernandes SA.	4.00%

All members of the ACE have joint and several liability for the obligations undertaken by the ACE which are guaranteed by their parent companies, or by the members of Novaponte themselves where companies don't have parent companies.

3.1.3.1. Design Sub-Contractor

Novaponte sub-contracted the design to **TejoProjecto** a consortium of four companies: One from the UK, another from France and two Portuguese: **Kvaerner Technology** (Owned by Kvaerner that meanwhile had acquired Trafalgar House Technology); **EEG** - *Europe Etudes Gecti* (part owned by Campenon Bernard); **COBA** - *Consultores para Obras, Barragens e Planeamento*; and **PROPONTE** - *Projectos de Pontes e Estruturas Especiais.*

3.1.4. Operating Sub- Contractor

Gestiponte – Operação e Manutenção das Travessias do Tejo, S.A. – wholly owned subsidiary of Lusoponte, established on 31st January 1995.

3.1.5. Senior Lenders

- EIB Loan: 23 billion escudos in Deutsche Marks (13.0%) and a further 37 billion escudos (20.0%); 20years.

3.1.6. Consultants

Consultants for the Government:

Not disclosed

Consultants of Lusoponte:

- Financial - Chase Manhattan Bank and Schroders were joint advisers.
- Technical – Jean Muller International.
    - Design - Tejo Ponte Control.
    - Traffic – Halcrow Fox & Associates. Symonds Travers Morgan audited.
    - Acer Consultants.
    - Tudor Engineering Company.
    - COWIconsult, Consulting Engineers and Planners.
    - Charles Lavigne & Alain Montois Architects.
- Legal - Morais Leitão, J. Galvão Teles e Associados (Portugal) and Arhurst Morris Crisp (UK).

Consultants for the Banks

- Traffic – Symonds Travers Morgan.

- Insurance – Willis Corrom - insurance package covers all risks.
- Technical – Northcroft – Construction and O/M costs are in line with expected.
- Legal – Abreu & Marques e Associados (Portugal) and Allen Overy (UK) – legal due diligence.

Brisa – At the time the sole operator of the Portuguese motorways was an operator/maintenance consultant for both the private and public partners.

3.2. CONTRACTS

The contractual structure is indicated in Figure 1.

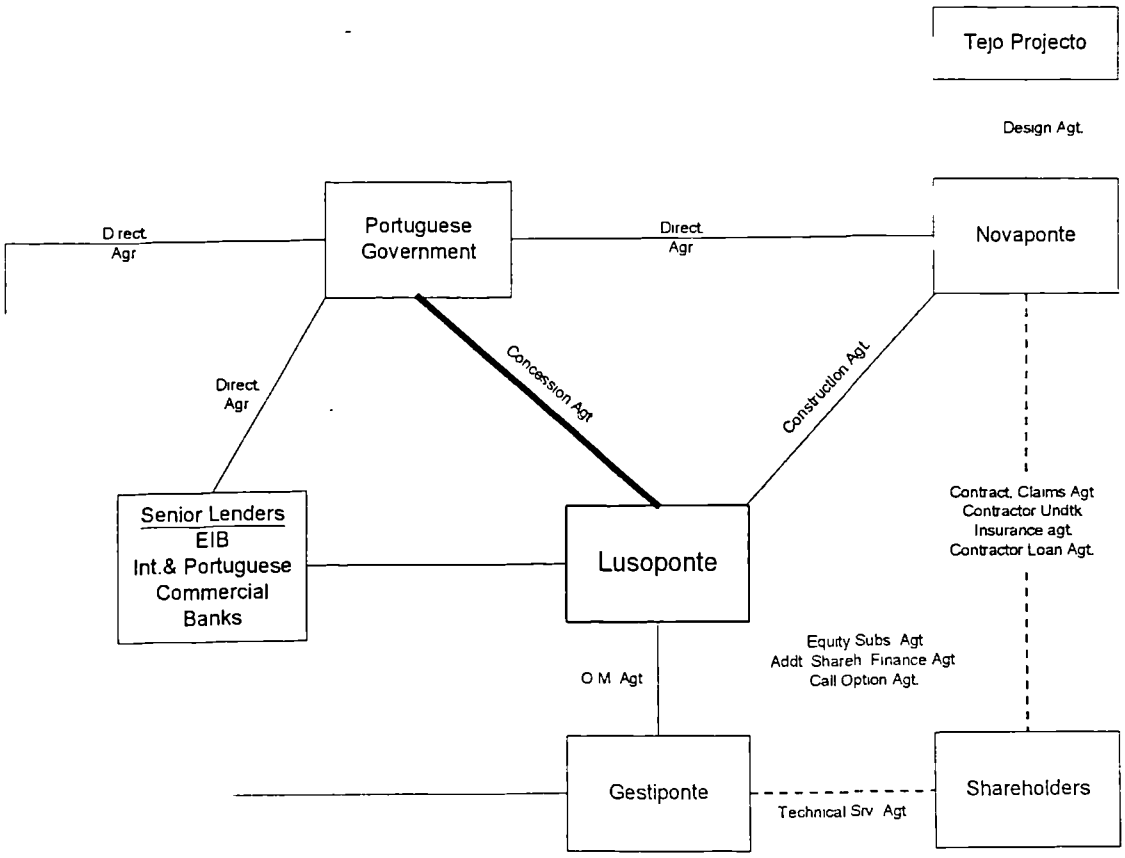


Figure 1. Lusoponte Contractual Structure

3.2.1. Concession Contract

The Concession Agreement, dated 24th March 1995, awarded the design, construction, financing, of the Vasco da Gama Crossing, and the operation and maintenance of both the existing 25th April (from January 1996) and the new Vasco da Gama Crossing to Lusoponte. The concession would expire at the earliest of:

- 24th March 2028 (a maximum period of 33 years)
- or a total cumulative traffic flow of 2,250 million vehicles and full repayment of the associated debt facilities under the Financing Agreements.

The concession requires equal toll prices on both bridges and provides mechanisms for compensation to the concessionaire in the event of unilateral modifications from the Portuguese Government.

The Concession Agreement has the following sections:

1. Introduction
2. Purpose and Type of concession
3. Duration of Concession
4. Contractor
5. Financing
6. Expropriations
7. Design, Project and Construction
8. Services Area
9. Operation
10. Maintenance
11. Environmental Protection
12. Other Rights of Authority
13. Restrictions on the Contractor
14. Warranties of Performance
15. Performance Monitoring by the Authority
16. Penalties
17. Authority Step-In
18. Termination
19. Financial Equilibrium
20. Intellectual Property Rights
21. Service Commencement
22. Other
23. Dispute Resolution Procedures

To settle all pending disputes and claims a GSA was signed on the 3rd July 2000. The most important agreements are:

- Extends and establishes the end of the concession as 24th March 2030 (concession life is extended to a fixed 35 years period), irrespective of the number of crossings (removing the traffic cap).
- A settlement of all claims and outstanding works completion issues.

3.2.2. Construction Sub-Contract

The construction contract consisted of seven distinct work packages that were split between the members of the consortium Novaponte:

1. **The Sacavém and EN10 Variant Interchanges - H. Hagen, Bento Pedroso Construção and Teixeira Duarte** - Two interchanges on the north side of Tagus link with the A1 motorway to the north, the CRIL and the EN10 Variant. The EN10 Variant provides access to Lisbon and the World Expo 98 site.

2. **The North Viaduct - Teixeira Duarte** - A 488 metres long viaduct, which spans the main railway line and several local access roads, with a variable deck width to accommodate the slip roads.

3. **The Expo Viaduct - Campenon Bernard SGE** - A 672 metres long viaduct comprising twin pre-cast concrete box deck segments on concrete columns of varying heights.

4. **The Main Bridge - Campenon Bernard SGE** - The Main Bridge is a cable-stayed structure with a 420 metres main span and two 203 metres side spans, based on two 150 metres-high concrete pylons, which give a clearance of 45 metres above high water at the Cala de Norte shipping channel. The deck is a composite structure with road slab supported by steel crossbeams, which span between concrete edge beams. The foundations consist of 44 bored piles of 2.2 metres diameter up to 65 metres deep.

5. **The Central Viaduct - Kvaerner Construction (formerly Trafalgar House Construction Special Projects) and Bento Pedroso Construções**. - Construction of the 6,531 metres Central Viaduct was carried out using 78 metres long pre-cast deck units weighing 2,200 tonnes placed on 81 piers founded on eight 1.7 metres diameter driven piles up to 95 metres deep. The deck is less than 14 metres above water for most of its length but elevates up to 30 metres over two shipping channels, the Cala das Barcas and Cala de Samora, with spans of 130 metres to accommodate medium sized

vessels. The piers are strengthened to withstand ship impact and five of the deck sections have wider edges to provide for emergency vehicle parking. A huge pre-casting yard at Seixal, 22 km downstream from the bridge, was used to manufacture units for this viaduct. The deck sections are made in eight pieces and then stitched into 78 metres long beams. The yard worked to a schedule producing one beam every two days.

6. **The South Viaduct - Somague** The 3,825 metres South Viaduct consists of 45 metres deck units cast *in situ* using twin launching girders on two fronts. There are 85 piers, partially on land and partially on marine driven piles. The viaduct runs through the Samouco Salt Pans.

7. **The South Access - Mota & Companhia** - The 3.9 km South Access links the crossing with the South Interchange through mainly agricultural land and connects with the A12 motorway to Setúbal and the Coina Regional Ring Road linking Alcochete and Coina. The toll plaza is located about halfway along this stretch for south to north traffic and incorporates 16 manually operated booths using cash and 2 automatic payment systems. A complete service area, sub-concessioned to Galp, is located on both sides of the approach next to the South Viaduct.

There are two additional contracts with Novaponte:

- Insurance Agreement;
- Claims Agreement (related to temporary works site) and Contractor Undertaking (related to the occurrence of Force Majeure events and defining the claims procedures and its financing).

3.2.2.1. Design Sub-contract

The design sub-contract was established between Novaponte and Tejoprojecto the Design consortium. Each member of the consortium was responsible for a different section of the crossing.

- Coba prepared designs for the whole crossing, for the north and south interchanges, including 21 art works, the service area and the toll plaza;
- Proponte - the North and South viaducts;

- EEG - the Expo Viaduct and the Main Bridge;
- Kvaerner - the Central Viaduct.

The architects Albert e Ronald Yee dealt with aesthetic issues of the crossing. The Architect Lavigne was a consultant for the design and construction stages. Sua Kay conceived the service area and toll plaza.[13].

The whole project took three years to complete involving about 250 technical staff from four different companies that produced more than 9000 drawings. After filing [12], the final design occupies about 50 m^3.

The work was co-ordinated by a design management team consisting of representatives from each company. The designs are in turn checked by an independent consulting consortium, **Tejo Ponte Control**, consisting of: A2P Consult, Estudos e Projectos Lda, Hyder Consulting Ltd., Provia Consultores de Engenharia Lda., and Tudor Engineering Company.

3.2.3. Financing Agreement

The financing of the Vasco da Gama Bridge was made through a Build Operate Transfer (BOT) scheme. The private sector undertakes the entire project, operates it commercially and at the end of the concession period transfers it back to the government. The shareholders carry the risks but receive a return on their investment and dividends during the period of the concession.

The Vasco da Gama Bridge is financed from the following sources:

- European Union Cohesion Fund subsidy: 64 billion escudos (35.0%);
- EIB Loan: 23 billion escudos in Deutsche Marks (13.0%) and a further 37 billion in Escudos (20.0%);
- Existing revenues from the 25th April Crossing: 10 billion escudos (6.0%);
- Others (shareholders, government grants, etc.): 46 billion escudos (26.0%).

[13] 'Ricardo Oliveira –Foi um trabalho de grupo', *Expresso*, 21-3-1998.

Of the total cost of the project (180 billion escudos), about 129 billion escudos are for construction and the balance – 51 billion escudos - for maintenance costs of both crossings, payment for expropriated land, re-housing, and environmental projects.

The European Union Cohesion Fund subsidy is non-reimbursable.

Loan agreement - The term of the EIB loan is 20 years, with no capital repayment over the first 120 months during which EIB assumes full project risk. There is a fixed interest rate for 15 years. During the remaining 15 years, the EIB's financing is guaranteed by a syndicate of commercial banks led by Chase and BPA. The commercial bank guarantee is designed to fall away as the project becomes profitable.

The EIB loan [14] is split 60% into Escudos (PTE) and 40% into Deutsche Marks (DM) and is guaranteed by two banking syndicates. The DM lenders provided with protection against possible escudo devaluation. The PTE facility is guaranteed by Banco Português do Atlântico, ABN-Amro Bank, Banco Pinto & Sotto Mayor, Banco Totta & Açores, Caixa Geral de Depósitos, and CISF. The DM facility is guaranteed by Chase Investment Bank, ABN-Amro Bank, Dai-Ichi Kangyo Bank, and Société Generale. A secondary syndication of this facility took place in February 1997.

The revenue from the 25th April Bridge accounts for approximately 50% of the revenues of the project.

Shareholder funding – According to the terms of the contract shareholder funding is made up of a Share Capital of 5 billion escudos (equity), plus 7 billion escudos of shareholder Supplementary Equity and an additional 1.2 billion escudos of "Deferred Suprimentos".

There are the following sub-contracts in the financing agreement with the banks:

- Escudo facility agreement;
- Deutsche mark facility agreement;
- EIB facility agreement;
- Bridging facility agreement – contrato e financiamento intercalar relativo ao subsidio da União Europeia;
- Contractor's loan agreement – contrato de empréstimo do construtor;
- Security agreement – contrato de prestação de garantias;
- Call option agreement – contrato de opção de compra de acções;
- Subordination – payment priority among the various entities;
- Forecasting – every 6 months the ratios of the financial model are checked;

[14] Inter American Development Bank 1995, *Directory of Innovative Financing.*

- Intercreditor – Procedure check list among the creditor banks (it increases security);
- Account – All the accounts are only in one bank - BPA checks if all the transactions are correct according to the contract. The relations with the affiliates are carefully checked.

Refinancing - After the opening of the Vasco da Gama crossing, Lusoponte has negotiated a refinancing package with EIB guaranteed by commercial banks - The Arranger Bank Group comprising Banco Comercial Português, S.A./BCPA- Banco de Investimento, S.A:, BNP Paribas, Caixa Geral de Depósitos and SG.

The original DM and PTE facilities were arranged in 1994, when respective interest rates were at higher levels making them unattractive in comparison to the current Euribor long-term rates (6-7 per cent). The original facilities were converted to a new longer-term Euro Facility, guaranteed by commercial banks over 19 years. It will have a 21-year tenor with a sculpted annuity style repayment, taking project risk for the final two years following release of commercial bank guarantees.

The second element of the refinancing is a new 19-year Euro 120 million term loan, floating debt indexed to Euribor, to finance the settlement of claims owing to Novaponte and to cover associated refinancing costs.

The original shareholder funded equity and supplementary equity remains in place. The standby Deferred Suprimentos has been reduced and renegotiated to cover defined risk events[15]

3.2.4. Operation and Maintenance Sub-contract

Lusoponte is responsible for all the routine and structural maintenance of the Vasco da Gama Crossing. As for the 25th April crossing it is only responsible for routine maintenance. The Portuguese State retains responsibility for all structural maintenance of the bridge and its access viaduct. Operations and routine maintenance have been subcontracted to Gestiponte. Lusoponte has the option to subcontract longer-term maintenance (e.g resurfacing of roads) either to Gestiponte or directly to a third party.

Before the inauguration of Vasco da Gama crossing in 1998, it had already been operating and maintaining the 25th April crossing since the 1st January 1996.

[15] Lusoponte 2000, *Memorandum* July.

3.2.5. Direct Agreement

There are three Direct Agreements (Lusoponte 2000)

- Portuguese Government ---- Banks/EIB;
- Portuguese Government ---- Gestiponte – Operation Co – temporary step-in, due to management problems with Lusoponte related with non-compliance;
- Portuguese Government – Novaponte – Construction Co. *the same.*

3.2.6. Shareholders Agreement

- Equity agreement;
- Additional equity agreement;
- Call option agreement;
- Technical Services Agreement - Certain shareholders are committed jointly and severally to provide necessary skilled personnel technical information and assistance. In this way Lusoponte can secure the expertise and experience of its ultimate sponsors.

3.2.7. Dispute Resolution Procedure

There are two phases: Pre-litigation and Litigation.

In the Pre-Litigation Phase the claimant will notify the other party identifying the matter in dispute and requiring the hearing of one of the two expert committees, the Financial and Technical Committees (Annex 19 of the Concession Agreement).

The Arbitration shall take place in Lisbon and be conducted in Portuguese.

3.3. LUSOPONTE – LIFE CYCLE

The Lusoponte's Life Cycle (Figure 2) started with the establishment of a business need for a new road crossing in 1990. Options were appraised by GATTEL that developed a Business Case and launched an international competitive tender in 1993. Afterwards the preferred bidder was selected from the shortlist, and the concession awarded to Lusoponte. Construction of the Vasco da Gama crossing started in 1994. In 1996, Lusoponte began operating and maintaining the 25th April crossing.

Lusoponte is currently undertaking a pre-feasibility study for a 3rd crossing over the Tagus as agreed in the GSA. The study involves: the selection among alternative locations (within the specified corridor Chelas- Barreiro), the undertaking of geological studies including drilling bores and also environmental impact studies. Lusoponte has to appraise options within the corridor Chelas-Barreiro, and develop the Business Case for the 3rd Crossing. The following stages: Official Journal European Community (OJEC), Bidding, Design and Construction are the government's initiative. The GSA omits any mention of these stages. Lusoponte has only the exclusive rights to road crossings, but as this will be a road-train crossing, it is expected the involvement of other partners will be required.

At the end of concession the assets will revert free of charge to the Public Sector. The re-tendering of the services is always an option but the concession contract doesn't mention it.

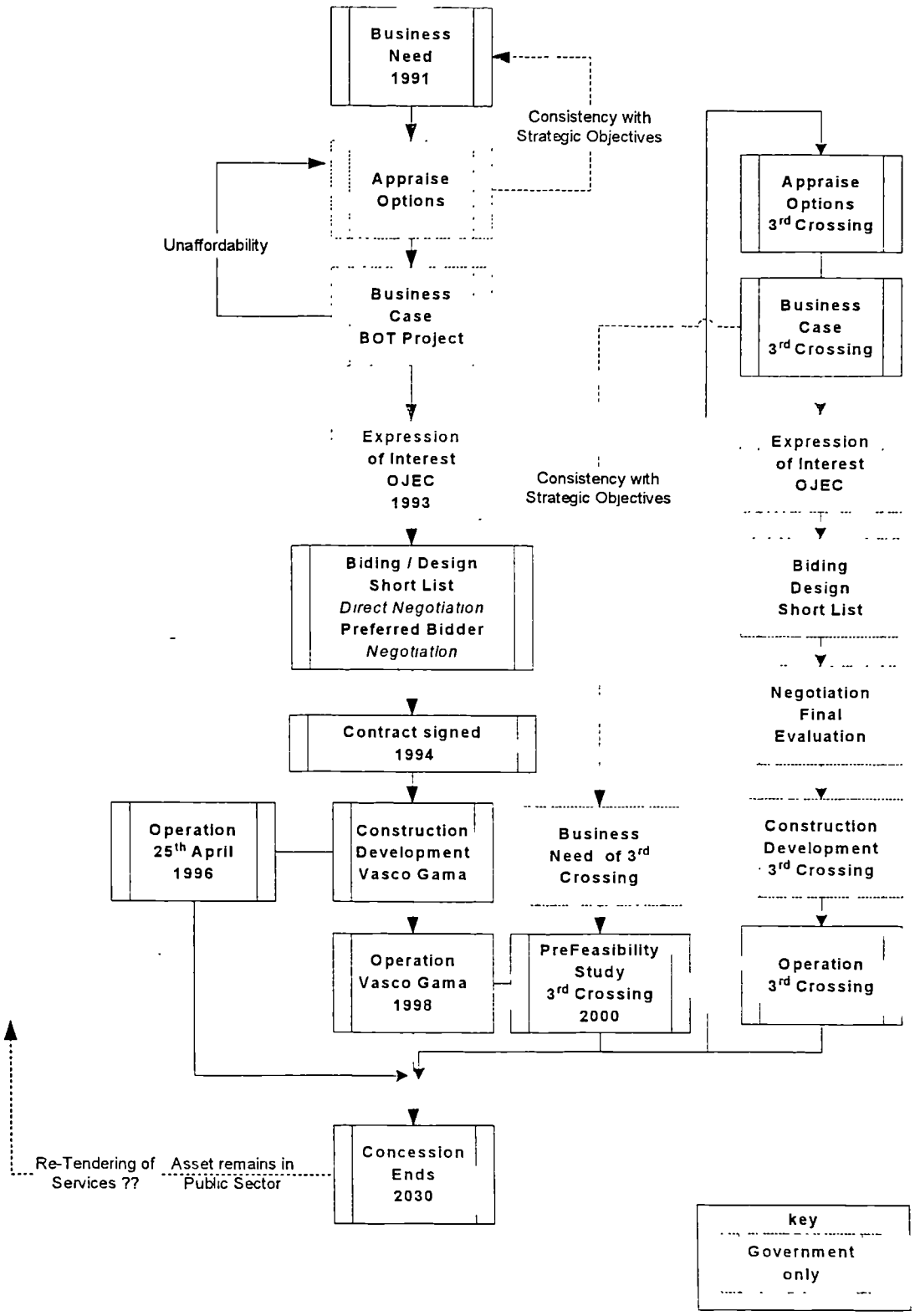


Figure 2. Lusoponte Life Cycle

3.4. LIFE CYCLE AND STAKEHOLDERS

In a project like Lusoponte, the stakeholders involved are numerous, but throughout its life cycle their intervention changes. While some appear in one or two stages, others are present throughout the entire cycle. The character of their intervention also changes: In some stages they play a critical role, while in others it can be mild. Table 1 identifies when the stakeholders intervened in the several stages of Lusoponte's life cycle, and also the character of their intervention: strong, normal or mild. This diagram contemplates the fact that Lusoponte has two different crossings that at some point in time were in different stages. A description of each stakeholder's intervention follows.

Authority – The authority intervenes since the beginning of the project, establishing the business need. Its intervention is particularly strong during construction and development because all construction works have to be previously authorised (by GATTEL) and afterwards have to be monitored and approved.

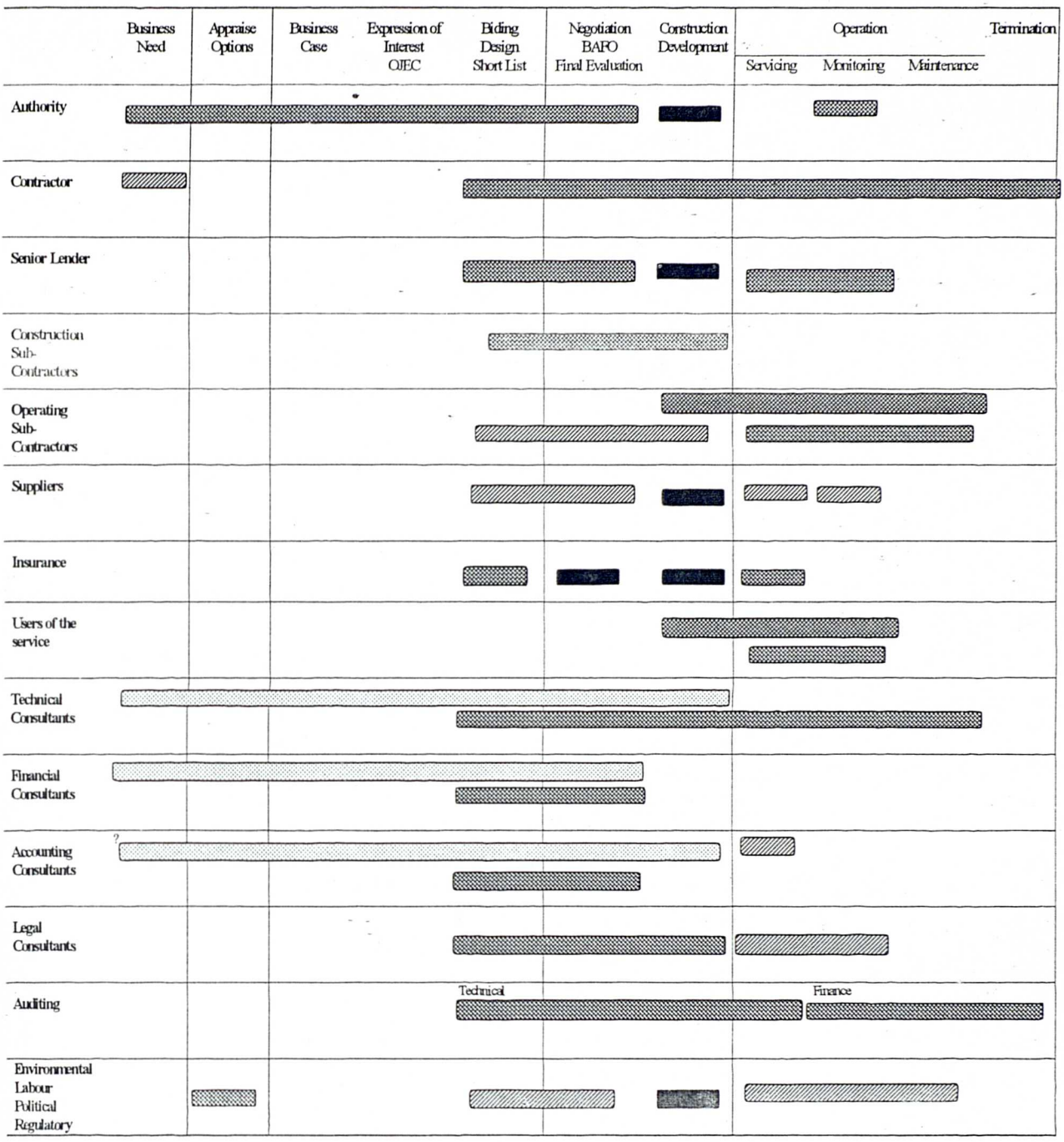
Contractor – The contractor's consortia always try to influence decisions at the establishment of Business Need and sometimes during the Appraisal of Options. The contacts are informal at the political level. Afterwards it is after the start of bidding that they actively intervene throughout the project until the end.

Senior Lenders – Prior to construction the intervention was not so direct, intervening only in the financial conditions and legal Due Diligence prior to the signing of the contract. The Senior Lenders most active intervention was during Construction and Development. It's the stage of the project were the big capital expenditures occur, and the great emphasis is on the risks associated with construction, like costs overruns and delays (with the associated penalties). After service commencement senior lenders intervention is much softer, assuming mainly the role of monitoring the financial ratios. After construction completion, the risks are diminished; usually there is a revision of the financing terms.

European Commission – EU partially financed the Lusoponte's project, and their intervention was especially strong after the signing of the contract and during construction when it conditioned the release of funds to the resolution of environmental concerns.

Construction Subcontractor – The intervention starts with bidding and design and ends at construction completion when the construction consortium is dissolved.

Table 1. Lusoponte – Stakeholders Intervention



Operating Subcontractors - The main intervention of the operating subcontractor lies after service commencement. Nevertheless although not formerly identified as the actual operating sub-contractor, people from that area intervene in the pre-service commencement period checking the functionality of design for the future O/M. The 25th April crossing was already in operation and the role of Gestiponte the Operating sub-contractor began during construction of the Vasco da Gama crossing.

Suppliers – Before construction their role was minimal, the only involvement is through eventual price consultations. The role of suppliers is very important during construction. During operation its role diminishes.

Insurance Its role starts with Bidding for consultation purposes. It is critical during the negotiation period with the preferred bidder and during construction. During negotiations its role is related to the process of risk transfer, advising which risks are insurable or not. During construction its importance lies in the sheer value of the insurances in place: 2.5 billion escudos. During operation (service and maintenance) its value is reduced to about 100 000 million escudos, because the number and importance of insured risks is much less.

Users of Service – The users intervention starts with service commencement. Similarly to the operating sub-contractors the users of 25th April intervened during the construction of the Vasco da Gama Crossing.

Technical consultants – There are different consultants to the public and private sector, and their intervention starts and ends at different periods. The technical consultants for the public sector start at the beginning when the business need is established and end when construction finishes (GATTEL is extinguished then). For the private sector their intervention starts in the bidding and only stops at the end of the project.

Financial Consultants – It's a similar situation to the above: Financial consultants for the public sector start with business need and end when the contract is signed, and construction begins. For the private sector the beginning of intervention is at the beginning of the bidding process, but the end is the same. The financial services are then executed in-house.

Accounting Consultants – The situation is identical to the financial consultants, with only one difference: After service commencement accounting services tend to be outsourced. (*There is the opinion that it should include Biding and negotiation)*

Legal consultants – For the private sector legal consultants have a strong intervention from the start of bidding until the end of construction. Their first major intervention is in the signing of the contract, and the second is dealing with claims during construction.

Auditing - At the beginning of design technical auditing starts and ends only when construction is completed because the detail design is still being developed. During operation and termination it's the financial auditors (and banks) that are involved.

Environmental – The environmental groups were active doing the appraisal of options. Afterwards their intervention was very mild until the award of the concession when all issues related to the EIA were raised. Their intervention was particularly strong until con.truction completion *(there are different opinions)*. During operation they retain a mild action monitoring the whole of the operation.

4. RISK TRANSFER

4.1. VALUE FOR MONEY (VFM) AND PUBLIC SECTOR COMPARATOR (PSC)

In the original UK PFI models the Government only approves the PFI financing scheme if it demonstrates that it produces Value For Money (VFM) when compared with the traditional methods of procurement. This means that PFI procurement generates savings to the public sector during the whole life cycle of the concession. This is done by comparing the contract costs with the Public Sector Comparator (PSC), which is calculated by costing what the public sector would have to pay to procure the construction, and the operation and maintenance of the crossing over the period of the concession.

In the Lusoponte concession there was no assessment of VFM. The decision to finance the project through a BOT scheme was made irrespective of this option achieving VFM. The BOT option has been essentially a political one to capture private capital for a project that otherwise would mean a huge capital investment for the state, increasing public debt to levels of non-conformity with the Maastricht Treaty Convergence Criteria.

In the Lusoponte contract there is the "Base Case" that can be mistaken for the PSC. The Base Case comprises only the project's financial projections, that is, the agreed financial equilibrium.

4.2. RISK ALLOCATION

The essence of PFI type contracts lies in the transfer of risk to the private sector. The underlying concept being that the risk is allocated to the party best able to manage it, and this results in costs reductions brought about by increases in efficiency and innovations introduced by the private sector. In the case of Lusoponte the concessionaire takes all risks inherent to the concession, but is entitled to a compensation if the financial balance of the concession is lost (Clause 101 of concession contract) in the event of:

- Unilateral modification by the Portuguese state in respect of the conditions of development of the activities in the concession provided that, as a direct result of such modification, Lusoponte suffers a material cost increase or a material loss of revenue;
- Occurrence of events of Force Majeure, save if as a result of such events, the termination of the concession agreement takes place;
- Occurrence of exceptional events causing extremely damaging changes in the international foreign exchange markets that significantly affect the underlying assumptions of the base case;
- Legislative changes that have a specific material and direct impact on the revenues or costs of the operation of the crossings (this does not include changes in law or tax law of general applicability).

The restoration of the financial balance can at the Government's discretion, be the following alternatives:

- Extension of the concession period;
- Extraordinary increase of toll rates;
- Direct payment of compensation by the Portuguese State;
- A combination of the above or any other form to be mutually agreed between the parties.

This form of risk transfer doesn't specify which risks are taken or shared by the public sector and instead forwards the renegotiations to relatively undefined events that might affect the financial balance of the concession. The balance is defined against the restoration of two out of three key criteria: *Annual debt service ratio, loan life cover ratio* and *net present value*.

Prior to June 2000, clause 101 – concessionaire financial balance – was evoked on six occasions.

The following sections characterise Lusoponte's main risk categories and the some adverse risks that have already occurred. Several interviews were undertaken and

necessarily the opinions are not coincidental. Sometimes the views are even opposed, reflecting the different viewpoint according to the function and also the risk profile of the interviewee.

4.2.1. Political and Regulatory Risks

There is always the possibility of grantor's step-in.

> *The Portuguese State (Lusoponte 2000) can redeem the Concession on one year's notice on the grounds of public interest after the expiry of at least four fifths of the latest projected term of the Concession (which would therefore allow redemption, according to the current projections, on or after 31st March 2017). Lusoponte would then receive compensation for redemption based on the latest semi-annual projections to the projected expiry of the Concession.*

Lack of consistency in governmental will - It has been observed that during the negotiations and after the signing of the contract the Government's orientation changes. Such changes have been noticed when the Social Democrats (PSD) Government was replaced by a Socialist (PS) Government. And also when a second PS government replaced the first PS government

The lack of consistency has become more apparent now that GATTEL's influence has diminished because: first, it was scheduled for extinction at the end of 2000, and, second because of a lack of political backing from the second PS government. Lusoponte now has to deal with the MOPTC and the Ministry of Finance separately. This creates co-ordination problems, the two Ministries don't have a common orientation, and although Lusoponte tries to sit both at the same meetings it is very difficult to find a common governmental orientation. It is like having to deal with several partners instead of one.

Third Crossing - Lusoponte as per the GSA and GFRA signed in July 2000, is undertaking a pre-feasibility study for the Third Crossing (road-train) over the Tagus. So far, the Government is politically determined to have a crossing that connects the north and south rail network, and although a road crossing looks necessary to alleviate

the 25th April crossing, it hasn't so far committed itself unequivocally to a road crossing. This Business Case will be the basis for the Government's decision regarding this crossing. This study consists mainly of traffic studies and other preliminary technical studies, for example, geotechnical. The existing contract doesn't award Lusoponte the design and construction of the crossing, and the decision to make (or not) the crossing lies entirely with the Portuguese Government. Also, there is an additional potential risk that Lusoponte will have to operate a crossing designed and built by another entity, whose concern is solely construction and not maintenance. Because, if the project is to have access to European funds it must be competitively tendered.

4.2.2. Economic and Financial Risks - Totally with the Private sector

Interest Rates – The contract had fixed interest rates and when the tender was launched, in 1993, the interest rates varied between 7-8%. In March 1995 they had climbed to 11-12%. Consequently, the Internal Rate of Return decreased from 11.43% to 10%. This risk was completely absorbed by the private sector without mitigation measures even insurance. The Portuguese financial market was not developed enough to permit the contracting of a 'cap', i.e., to insure the risk of excessive increases in the interest rates. As a result the risk was reflected in the project adding an extra 8 billion escudos to the overall project cost.

Contract not yet shielded reduces financing options - The 20-year EIB financing was needed because at the time of the contract there was no other entity that would lend over this period, as an example, public debt was not issuing bonds at such long-term the maximum was 10 years. The other option for long-term financing - capital markets - was considered inadequate for this project. A monoline[16] finances long-term, but with thousands of investors in the stock markets, needs a very stable project. It is completely impossible to refinance, and there are very strict controls of the variability of the financial ratios. The EIB financing was a strategic decision taken by the shareholders. In the last refinance negotiations EIB and a US monoline were competing for the financing with very similar conditions. The shareholders knowing that the project was not contractually shielded, and that it would not reach financial stability for a prolonged period (due to the third crossing open possibilities for construction), opted for EIB financing because it was more flexible than a monoline financing.

As to the additional financing needed for the third crossing in the event that design and construction is awarded to Lusoponte, one of two options is possible:

- It will be included with the existing financing, involving a global financial restructuring of the project.
- It will be individually financed, separately from the existing finance agreement. The loss of revenues (estimated as 100 billion escudos) due to diverted traffic from the other two crossings will then imply a revision of the Lusoponte Base Case.

4.2.3. Social Risks

Expropriations - Lusoponte took the risk of expropriating all the land necessary for temporary and permanent works, including the risk of land price inflation. This was the first time that this process, normally undertaken by government agencies, had been carried out by a private sector company. The Government's sole role was to declare the designated areas for "public benefit". This administrative process was well conducted. At the beginning, there were 350 parcels to expropriate, out of these 250 settled amicably and 100 had a Court settlement (20 are still pending). Some tried to speculate by asking for unreasonable values. For example, an industrialist asked for 1.8 billion escudos, and finally it was settled by the court for 280 million escudos.

On the north shore, there were two areas: the EXPO98 site– a disused industrial area and to the northern end, property was predominantly commercial and residential where 273 families were re-housed in new apartments constructed by Lusoponte or received financial compensation. A new primary school is being built at Portela to replace one demolished on the boundary of the Praça José Queirós access and an old age day care centre in Moscavide has been relocated. On the south shore land was predominantly agricultural.

Late access and additional land purchases (see Samouco Salt Pans) resulted in a number of disputes between Lusoponte and GATTEL

Buzinão (Big Hoot) – According to contractual terms, the tolls for each crossing where to be equalised. As a consequence of this the Portuguese State raised the tolls on the 25th April Crossing in June 1994. This caused a public outcry (buzinão) and the

[19] Monoline credit insurer – Insurance company that only insures credit lines (no other lines of insurance).

government was forced to rescind this decision. The toll will remain frozen at 150 escudos (for class 1 vehicles) until 2002, when it will be raised to 200 escudos (1Euro). A rise of 1.5 times the Base Toll instead of 2.6 times. In addition, the Portuguese State imposed on Lusoponte a Frequent User Discount Scheme (FUDS) in August 1994 for users of the 25th April Bridge only. A 10 percent discount for users pre-purchasing books of twenty tickets with no date limit, and a 20 percent discount for users pre-purchasing books with a one month limit was introduced. A further scheme was introduced for the Via Verde, allowing a 50 per cent discount after the 13th trip within a month, and with all trips after the 72nd being free.

As a result the Portuguese Government had to agree on six compensation packages required to restore Lusoponte's financial position in relation to the GATTEL Base Case.

4.2.4. Environmental Risk

The environmental group's pressure led to:

- The European Commission conditioned the availability of funds subject to the existence of an approved EIA (influenced by the Commissioner Wulf-Mathies).
- Alleged violations of the EIA. This resulted in the suspension of EU funds, until the signing of a protocol between the EU and the Portuguese State establishing conditions that had to be satisfied for a further release of funds.
- Increased expropriation of an area of 300 ha, to include the Samouco Salt Pans special protection area. The viaduct would typically have required a much smaller area. This resulted in a claim (now settled by the GSA) of 1.2 billion escudos for expropriation and refurbishment of the salt pans area.
- The building of a viaduct instead of an embankment to cross the saltpans. Initially the crossing of saltpans was to be made by embankment, but to avoid a detrimental effect upon the area a 4.5 Km viaduct was built which meant an increase of 25 billion escudos in costs.

The Lusoponte's staff also includes an Environmental Engineer, which was not anticipated at the beginning of the project.

The environmental impact of the bridge was controlled and minimized by:[17]

- Measures to minimize noise levels and air pollution including landscaped acoustic barriers;
- The leaching of metals from the bridge is controlled. On the South Viaduct, where it crosses the saltpans, the rainwater runoff, contaminated by metals, oils and other pollutants, is collected in three treatment tanks;
- The construction not affecting the fish nursery areas in the estuary;
- The disturbance of river sediment being a one-off situation, and was not significant since the estuary is very dynamic – every day 1/3 of the water volume is transferred to the sea by the tides- consequently, the tidal erosion in the riverbed is very high, rendering irrelevant the disturbance caused by the bridge
- The greatest environmental impact of the crossing being the urban development on the South shore. How this development will proceed depends on the Local Authorities permissions for urban developments in an area that was mainly rural. The monitoring studies that Lusoponte regularly undertakes, includes an evaluation of the social and economic conditions surrounding the Vasco da Gama crossing.

Apart from the risks associated with environmental concerns, there are risks related to the social visibility of the project. Due to the extensive litigation between Lusoponte and GATTEL and especially with the indemnity that was awarded to Lusoponte regarding the claims of loss for revenues on the 25th April Crossing imposed unilaterally by the government, the image transmitted to the public by the media (and some political parties) was that the project was costing a lot of taxpayers money. This negative image was even extrapolated for the essence of project finance, creating the assumption that this type of financing was expensive and likely to need a lot of taxpayers' money and consequently pawning future generations' income.

4.2.5. Legal Risks

[17] Prof. Dr. João Gomes Ferreira, UNL, Interview 14 Jun 2000.

The concessionaire assumes full acceptance of the risk associated with changes in general law or taxation. The only exception is changes in regulations that affect directly and adversely the operational revenues of the crossings. Legal Due Diligence investigation checks the adequacy of existing legislation with the contract responsibilities, and was done before final signing of contract by the banks to ensure that all contracts accord with the Portuguese and UK law. Of all the contracts – concession, warranties, intercreditor, etc – only the security agreement has to accord with Portuguese law only. This is a crucial contract for the banks because it is the warranty against their financing and all assets given as a warranty are in Portugal and any disputes must be ruled in a Portuguese Court. Given the intricacies of Portuguese law it is sometimes difficult to adapt the contract to UK law. The reverse is not true. All the other contracts are usually drafted according UK law, and are easily accepted.

In spite of all Due Diligence investigation problems occurred with Via Verde. One related to alterations in the existing contract with Brisa and another with a legislation gap. After the signing of the contract but before taking over the operation of the 25th April crossing it was found that the conditions of the existing contract with Via Verde were changed (from the time of contract signature?). This led to claims against the grantor. Also the transgressions on Via Verde led to legal problems – When a car without transponder crosses Via Verde it is registered and a procedure starts to recover the payment and fine. When the concession was signed it included obligations against the transgressors, but in reality there was a gap in the legislation and Gestiponte didn't have effective power. It took four years to update the legislation and give Lusoponte the power to issue notifications against the offenders.

4.2.6. Construction Risk - Totally transferred to the Private partner

The detail design was developed during the construction stage, and work could only start after GATTEL's approval. Because of the delays in the signing of the contract, and to assure that construction could be completed according to schedule it was necessary to:

- Support additional temporary site installation costs. All the resources needed for construction were made available by the French partner even before the final approval. While waiting for the 'green light', they undertook minor works. In the end this measure, although costly, paid off because construction could begin

the day of the final approval, and it was not necessary to wait for the mobilisation of resources;

- During this period the design team was developing work at Lusoponte's risk;
- Novaponte commenced construction at its own liability in July 1995 before GATTEL's approval.

The crossing was designed to last 120 years, so special care was given to the structure. This resulted in additional costs and/or delays because:

- The driven piles were supposed to be 60 m deep, but instead it was necessary to go up to 100m deep, greatly increasing costs;
- The intertidal zone of the piles has twice the anticipated thickness of concrete to prevent corrosion of the steel cables;
- The unavailability of land considered in the proposal for temporary site installations and consequent need to relocate and split up such installations.

The Vasco da Gama Crossing has been in operation for two years but the construction risk has not been extinguished, because the outstanding works were expected to be finished by the end of December 2000. After the Final Inspection Report, Lusoponte will issue the Final Acceptance Certificate to Novaponte. Novaponte's shareholders confirmed its commitment to carrying out all works necessary to achieving Final Acceptance Certification. They are fully liable for completion.

The Inspection Report acted as a pressure instrument during the period when all disputes and claims were pending.

The one-year defect warranty period (after delivery) has now expired. The question now is the definition of delivery. After two years in operation there are issues that arise and that are related with the usage of the asset, and it becomes difficult to distinguish between those and problems related with construction that should be covered by the defect warranty.

After the Final Acceptance Certificate by Lusoponte, there is a one-year warranty for a 12 month maintenance period, during which any minor defects, imperfections or faults have to be remedied. For latent defects there is a 10-year (after Final Acceptance)

performance warranty. The consortium Novaponte will be dissolved after finishing construction but the liability is transferred to the shareholders.

There is also the potential construction risk of the Third Crossing – Lusoponte has exclusive rights to the exploration, but the agreement omits design and construction. Nevertheless, it can happen that, in the future, Lusoponte shareholders might be part of the construction contractor consortium for the Third Crossing.

4.2.7. Design Risks

The main difficulty encountered was the need to comply with the construction schedule (that was already very tight) co-ordinating the delivery of the designs so that the constructors wouldn't be stopped by a lack of design details.

During construction, GATTEL[18] imposed several modifications to the preliminary design, as well as the construction designs. These caused significant delays in the relevant approvals besides the additional costs incurred by changes in the nature of construction works and the need for land availability. The delays also caused significant onerous acceleration measures to ensure timely completion. This led to claims by Lusoponte that amounted to 25 billion escudos. The most important were:

- The reformulation of the link to Pc. José Queiroz on the Northern Bank. The initial project was for a level connection, which was soon discarded. In Oct. 96 the connection was not yet defined. One of the main reasons for the delays was the need to coordinate all intervening authorities: GATTEL, EPAL (Water company because of the Alqueva Aqueduct), Municipality of Loures and Lisbon, Expo 98 and CCRLVT (Lisboa and Vale do Tejo Regional Coordination Committee);
- A similar situation involved the Southern connection, also involving the need to coordinate several entities, among which were Brisa (concessionaire for motorways) and JAE (Roads Authority);
- The reformulation of Sacavem Interchange, also involving increased construction works. Extra cost amounted to 3.2 billion escudos;

[18] GATTEL interfered constantly in the minimum technical details. For example, there was an engineer that insisted so much, on a particular white for the painting of the bridge (which was not easy to obtain) that it was named the 'Machado White'.

- Remediation.

4.2.8. Commercial Risks

4.2.8.1. Traffic Risk - Totally Transferred to the Private sector

One of the reasons for the inclusion of the operation and maintenance of the 25th April crossing was to mitigate traffic risk, and consequently to diminish risk for the overall project Both crossings connect the urban area of Lisbon to the south bank, so it was reasonable to assume that traffic would be diverted, the extent of which was very difficult to predict. Whereas when considering combined traffic the uncertainty is much less. The other underlying reason was to obtain revenues to partially finance the project.

Traffic Risk has been accepted by the private sector. It depends mainly on:

- GDP Growth;
- Timing and development of the south bank;
- Car Ownership - In 1998, the Lisbon area had 421 vehicles per 1000 inhabitants, and in Setubal (south bank) 319 vehicles per 1000 inhabitants. Saturation is believed to be about 600 vehicles per 1000 inhabitants;
- Level of tolls - People always look for cheaper alternatives. Both bridges have tolls only northbound. It is noticeable in the traffic statistics that some drivers enter Lisbon from the south by the 25th April Crossing, which is cheaper (150 vs. 320 escudos) and leave town by the Vasco da Gama Crossing, which has no traffic jams and no tolls in this direction. The daily traffic flows (average in the year 2000) in both crossings shows clearly this trend

Vasco da Gama - South to North 26 000 cars/day

North to South 28 000 "

25th April - South to North 78 000 cars/day

North to South 73 000 "

The difference in traffic northbound and southbound is superior in the 25th April Crossing where 5000 cars more enter Lisbon than leave, while that on the Vasco da Gama it's the reverse: there are 2000 more cars leaving Lisbon then entering.

- **Impact of fuel price increases** - In Portugal the Government sets controls on fuel prices imposing a maximum price to the public. In March 2000, the time of the first increase in fuel prices, there was a decrease in traffic during the following two months, after which it returned to the previous levels. The price increase that took place in January 2001 (+5 escudos per litre) was small with negligible negative impact. By the end of 2001 it is expected that the government will liberalise fuel prices, which will undoubtedly mean a much higher price increase (between 5-30 escudos). It is important to note that if this price increase coincides with an interest rate increase, and consequently an increase in mortgage loan repayments, the impact will be especially significant because the great majority of commuters are low to middle income young couples who moved to the southern bank because of cheaper housing;
- **Lisbon traffic restraint policies**;
- **Competing transportation modes – Rail link** - The negative impact seems to have been overestimated. It is operating above expectations, but this either released suppressed demand or captured traffic from buses (Barraqueiro cancelled their buses) and ferries. As a result the 25th April Crossing has reached full capacity one year after the opening of the sixth lane, instead of the anticipated 3 to 4 years;
- **Impact of Carregado bridge upstream of Vila Franca de Xira** - There is always the possibility to construct another crossing outside the area of Lusoponte's concession, upstream of Vila Franca de Xira just beyond the concession's limit.

So far all projections have been too pessimistic, traffic has increased on both bridges (Table 2), indicating a stronger than expected suppressed demand (Gestiponte data)

Table 2. Yearly Traffic for the two Crossings

Year	Actual Traffic		
	Yearly Crossings 000's	Annual Average Daily Traffic	Growth
1997	51,234	140,367	+1.1%
1998	60,106	164,674	+17.3%
1999	69,442	190,252	+15.5%
2000	76 018	208,268	+9.5%

4.2.8.2. Operation/Maintenance costs

4.2.8.2.1. Maintenance Costs

Role of Operation and Maintenance (O/M) prior to servicing - O/M was involved since the beginning of the project. The initial team had three members: Engº Firmino de Sá (formerly Brisa and the current Gestiponte O/M Director), an expert from the Dartford crossing, and an expert from Eurotunnel. Their task was to evaluate the adequacy of design to simplify O/M, keeping its costs at the minimum possible level. For example, the access to the South Viaduct structure for routine inspections (check sensors, support apparatus, etc), were planned from the start: The existing suspension cables would not permit a cradle installation to accesses under the deck for inspection. The O M proposed a project modification: the installation of a small fixed platform for inspection that would run beneath the 800 metres long deck. This resulted in a much more efficient maintenance programme.

Sacavem Interchange - The maintenance is partially from Portugal Road Institute (IEP). There have been some problems with illumination, due to recurring thefts of copper cables. Gestiponte has replaced the cables at a cost of 28 000 thousand PTE because of security and also to maintain the image of the company. The public doesn't know that the responsibility rests with IEP.

4.2.8.2.2. Operation costs

The Via Verde (electronic toll charge) utilisation has induced two factors that impacted on the financial Base Case:

- Higher costs due to a higher utilisation than expected;
- Violations (non-payment of toll).

Higher running costs of Via Verde The Via Verde was developed by Brisa to facilitate toll collection on motorways, and is in operation on all Portuguese toll highways. The car has a transponder that identifies the vehicle, its class, and activates a direct debit to the driver's bank. It permits 1200 car crossings/hour instead of an average of 250 cars/hour (some manual operators in peak time can reach up to 480 cars/hour).

The electronic tollbooth creates more costs per car (costs per transaction) than the manual tollbooth. There are bank costs, processing costs, mailing costs and the costs incurred by the non-payment (cars that go through without paying) and subsequent procedures to try to recover payment. In the base case all these costs were accounted for, but what happened was that the increased utilisation of Via Verde was much higher than expected, and consequently the costs were higher than expected.

In 1995, 25% of cars used Via Verde and 5% Multibanco[19], and it was expected that in 2000, it would be respectively 37% and 8%. Actually, the rate of increase was much higher and in 2000, the real values are 51% for Via Verde and 15% for Multibanco.

Non-payment of Via Verde – When a car without a transponder crosses Via Verde it is registered and a procedure starts to recover the payment and fine. This is a costly procedure, so on one of the two Via Verde lanes on the Vasco da Gama Crossing a gate was installed that only opens when the car is properly identified. Other more efficient methods are currently in development to be applied on all Via Verde lanes. As an example, when Gestiponte started operating the 25th April crossing, violations accounted for up to 5 per cent of all transactions. The enforcement system using a video recording, and the legal process, didn't allow the prevention of violations or an effective recovery. It took four years for the government to adjust legislation and give

[19] Multibanco – An interbank network for debit cards. The driver hands over the card and the operator debits the toll amount. No need for code input which speeds up the procedure.

Lusoponte the power to issue notifications against the offenders. Now if the offender is not immediately stopped and notified by the GNR, a notification for voluntary payment of a fine and the tariff is mailed. If it is not paid (the majority are) the process proceeds to courts (which is costly). Lusoponte recovers 40% of the fine and the due tariff. The installation of more accurate equipment and a sensitisation campaign for the users enabled the reduction of the level of violations to 1 percent of total tolled traffic.

Inheriting an old system - Before Gestiponte took over operation of the 25th April Crossing, but after the signing of the contract, they found out that there were major deficiencies in the toll collecting system. The manual system was completely revised to improve the control and monitoring, from the moment the toll is paid to the reconciliation phase. This has led to claims against the grantor.

4.2.9. People Risks

The culture of Portuguese construction is very much towards secrecy in the accounting issues. Traditionally this is a very closed sector. At first, it was very difficult for them to adapt to a culture of complete disclosure of information, as is necessary when dealing with a project finance structure.

4.2.10. Force Majeure

Lusoponte is exempt from liability for non-fulfilment of its obligations arising from an event of Force Majeure, defined as 'unpredictable and irresistible events alien to the parties' to the Concession Agreement, which have a direct negative impact on the concession. Lusoponte is entitled either to the restoration of the financial balance of the concession, or in cases where the restoration proves to be unreasonably onerous to the state or the impossibility for performance becomes permanent, to terminate the agreement. An example is the social unrest that occurred when the Government raised tolls at the 25th April Crossing in 1994.

4.2.11. Residual Value

Zero Residual Value. The Crossings will be handed over to the Government at no cost.

4.3. ACCOUNTING ISSUES (PROCESS)

The big problems are still to come. So far, accounting issues have been settled with the Ministry of Finances on a problem-solving basis. The Ministry has so far shown a great level of understanding and resolved the situations. For example, it has authorised that the amortizations would be proportional to traffic, instead of constants, as the law states. The authorisation was based on the project's specific idiosyncrasies that were not covered by the existing regulations.

There are still problems pending with VAT, related with structures that don't generate income, like viaducts

5. KEY MESSAGES

For the Private Sector:

- There is a marked effect on corporate culture in comparison to the prevalent organisational culture in other Portuguese companies. There is a greater emphasis on efficiency, cost consciousness, whole-life cycle costing, accountability and also the notion that the client is important both in terms of safety and satisfaction;
- Great improvement in efficiency and effectiveness;
- As the concessionaire is responsible for both the construction and maintenance, it has a strong incentive to minimise costs on a whole-life cycle basis, and not to pursue initially cheaper solutions that in the long run would be more expensive;
- The process is totally transparent, which is something not common in the Portuguese corporate culture; particularly the construction sector which is notorious for its culture of secrecy;
- The Human Resources of the concessionaire are typically highly qualified, with wages above average;
- The knowledge and experience gained has been incorporated well within the private sector. Some Portuguese members of the consortium participated successfully in subsequent tenders in the transport sector, for example DBFO roads;
- The environmental impact can be positive. The construction of the crossing has had an environmental impact but on the positive side has enabled the remediation of degraded areas, like the salt pans. These were in ruin;.
- The risk of underestimating the environmental issues. This led to the signing of contracts without an approved EIA. Between the award of the concession to Lusoponte in June 1994 and the approval of the EIA in February 1995 there was a period of indecisiveness as to the viability of the project. Until February 1995, there was no certainty regarding the availability of funds, and although the concessionaire undertook all the actions to start construction it took the risk that the project wouldn't be approved;

- Difficult co-ordination with the public partner. It was easier to deal with only one entity like GATTEL, now it is more difficult because different entities have different opinions and there is no central directive.

For the Public Sector:

- The need for having a stable design and predefined scope of works (no additional works) at the time of the signing of the contract was undermined by the public partner. After the signing it kept asking for additional works and revisions in light of the prevalent philosophy of projects financed the traditional way by the Government. This led to a high level of litigation and claims from the private partner. This procedure is common in the traditional methods of procurement where the client keeps asking for alterations and the constructor presents new cost estimates for additional works. This usually leads to significant cost overruns in the projects;
- The public partner underestimated the social impact of raising tolls on a bridge that by common knowledge had already been paid for. The public perception being that in due time it would be without toll;
- One of the main learning points summarises some of the above: All concession contracts have to make a realistic and exhaustive risk analysis and establish the management measures during the negotiation phase. A high level of litigation can then be avoided;
- Knowledge management is also a weak point for the government. The negotiation team of the government represented by GATTEL had no formal procedure to disseminate the knowledge and experience gained during the negotiation and construction stages. When GATTEL dismantles this knowledge will be lost to the government, since different people will conduct future projects and no formal procedure to retain the knowledge is in place;
- During the negotiation as the government changed, most members of the negotiation team were replaced and had no previous knowledge of the contracts in discussion. The Lusoponte file had 114 different documents in discussion, which were well known to the previous members, as they were the ones that were involved in drafting them. The government has put itself in a weak negotiation position;

- Similarly to the UK there should exist an evaluation of VFM, ensuring that the project is less costly than when compared with the government's traditional procurement. This would help to reduce some perception in the political and media environment that a PFI is more costly and that the State is pawning future generations income;
- The Public Sector as the owner of the project has to be careful when applying the UK rules. One major difference is that in the UK there is no EU funding, so the rules by which the Government has to abide are different from the UK, where financing from the Government comes from its own budget.

Acknowledgements

The authors are grateful to all staff from Lusoponte, Instituto de Estradas de Portugal, ABN-Amro Bank, Banco Efisa, BES Investimento and others for their valuable contributions, opinions and assistance received in preparing this case study. The authors are also grateful to Lusoponte and Engº Miguel Curado for the permission to utilise the photographs.

All opinions expressed in this case study are those of the authors alone.

ANNEX III

CASE STUDY

VICTORIA DOCK PRIMARY SCHOOL

PRIVATE FINANCE INITIATIVE (PFI)

CASE STUDY

VICTORIA DOCK PRIMARY SCHOOL

Teresa de Lemos

Victoria Dock Primary School

Project synopsis

Title - Victoria Dock Primary School.

Country – Kingston-Upon-Hull, East Yorkshire, United Kingdom (UK).

Project Cost - Total cost was £1 million.

Sector – Education.

Status - Operating since January 1999.

Sponsors – The Victoria Dock School PFI Limited owned by Sewell Construction.

Purchaser – Kingston-Upon-Hull City Council Education Authority.

Financing Package – The City Council contributed with £200,000 covered by the Central Government. The Private partner applied £250,000 of their own funds and recurred to a traditional corporate finance bank loan over 10 years for financial leverage for the remainder of the financing.

Special Features - It was the first school in the UK to be built under a PFI scheme. The PFI project was negotiated in 1998 between the Hull City Council and Sewell Group to become the first school PFI which was opened by Deputy Prime Minister John Prescott in January 1999[1]. It was such a successful project that an extension of facilities soon had to be contemplated. The new building was completed in January 2001, and opened by Lord Puttnam in September 2001.

The land where the school was built has been leased to the Sewell group for 40 years, although the PFI contract is for only 25 years. After this period and for 15 years the buildings and land can have alternative usages such as: continue as a school, disco, nursery, homecare, according to the local residents' needs in 25 years.

[1] http://www.sewell-group.co.uk/pfi-base.html (accessed 26 November 2001).

1. BACKGROUND – HISTORY AND OBJECTIVES

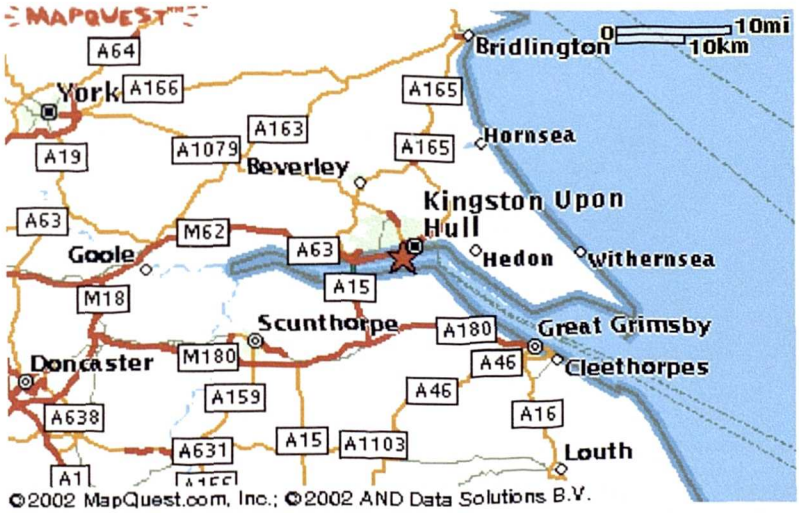
1.1. PFI IN EDUCATION

The use of PFI in the Education sector has been greatly encouraged by the UK Government. As an example, it was announced[2] by the then Education and Employment Secretary David Blunkett that, for the year 2000, a total of £100 million was made available to enable high quality PFI projects to modernise schools.

The Victoria Dock Primary School is located in Kingston-upon-Hull and serves the new estate development of Victoria Dock. It is part of a revitalisation programme of neglected areas such as the docks. It was built by public pressure due to lack of educational facilities in the area. A PFI scheme was used because Hull City Council didn't have enough funds to build a new school.

1.2. KINGSTON-UPON-HULL

Figure 1. Kingston-upon-Hull



Kingston-upon-Hull is the main county town of the region of East Yorkshire (Fig.1), whose history goes back 700 years to the reign of Edward I, who realising the strategic importance of this growing port on the River Humber, conferred upon it the title of Kings Town upon Hull and granted the town its first Royal Charter in 1299. Within its 71 square miles the city is home to a population of almost 269,000 people [3].

It is a city famous for its docks, and while the bulk of the fishing fleet may have gone forever, business is still booming in the port, a key European link for the rest of Britain

[2] 'UK Government: Extra repair cash will replace temporary classrooms' *http://www.globalarchive.ft.com/search, Full articles – M2 press wire*, 11 November 1999.

and Ireland. Today the docks handle more than 10 million tonnes of cargo yearly and a million passengers.

Hull has successfully moved from being a black smog industrialised city to a city that is coming to terms with modern days. In Hull there is an historic Old Town area, the Hull Marina, historic pubs, top class educational facilities, including the world-renowned Hull University, the Princes Quay Shopping Centre and some of the finest shopping in the north of England. New developments include The Deep, a new sports super stadium and a city centre Ferensway redevelopment which will involve a new transport interchange, shopping facilities, parking and the pioneering Hull Truck. It has libraries, theatres, museums, cinemas and art galleries, while its new look marina attracts yachtsmen from all over the world. A mile or two south from its centre stands the Humber Bridge, the longest single span bridge in the world, and the region's most famous landmark.

2. THE BIDDING PROCESS

2.1. TIMETABLE

After the Invitation to Negotiation (ITN) the negotiations took 12-15 months before the signing of the contract. The major delay was caused by the need to sort out the legal details - it took 6 months while in normal circumstances it would have been 2 months. The lengthy negotiations were worsened by a very rough design. Only after being selected as preferred bidder was the design refined and detailed by Sewell.

The school was scheduled to start operating in January 1999, which made it necessary to reduce the construction stage from 9 to 6 months which was achieved successfully, and inaugurated by the then Deputy Prime Minister John Prescott.

Lord Puttnam inaugurated an extension of the school premises in September 2001.

[3] http://www.guide-2000.co.uk/site/kingstonuponhull.htm (accessed 26 November 2001).

3. THE CONCESSION

3.1. MAIN PARTICIPANTS

3.1.1. Authority

Kingston - Upon - Hull City Council Education Authority.

3.1.2. Contractors – SPV

The Sewell Group is a very sound 120 years old family business with headquarters located in Hull Northern England. The group consists of the following companies: Sewell Construction, Maintenance, Homes (developers), Joinery, Services (Facilities Management), Decorations and Service Stations. Being a developer has given the group a sense of a long-term approach to business.

The Sewell Group had past experience in school construction and property development. Being a believer in planned maintenance the group has a great deal of involvement and expertise in building maintenance, refurbishment of schools and hospitals, etc.

3.1.3. Construction Sub-Contractor

Sewell Construction undertook the construction.

3.1.4. Operating Sub- Contractor

Sewell Facility Management provides the facilities management.

3.1.5. Senior Lenders

Royal Bank of Scotland.

3.1.6. Consultants

EC Harris was appointed by the RBS to provide technical risk advice – design, construction, operation and preventive maintenance.

3.2. CONTRACTS

3.2.1. Concession Contract

The land where the school was built has been leased to the Sewell group for 40 years. The PFI contract for educational services is only for 25 years. After this period they can use the building for another 15 years and possible options for future utilisations are: continue as a school, disco, nursery, homecare, or any other that will suit the community's needs. The reason for the possibility of an alternative usage for the buildings is that in 25 years demographics in the area will change and there might exist no need for a school, and other utilisations will be more useful.

Payment is against square footage of class space availability and performance. In case of teachers absence due for example to illness or other external cause that affects availability or performance they loose their revenue. This loss is covered by insurance and the premium is built into the financial model.

After 40 years the buildings and the land are to revert to the council. A possible extension of the contract is on an open book basis, i.e., the concessionaire states all the costs which are verified by an auditor from the Authority.

The school started operating with 60 pupils in 1999, in 2000 had already 94 pupils (26 in kinder garden) with ages ranging from 3 to 11, distributed in 3 classes: 3-5, 6-7 and 8-11.

The school has been operating successfully having earned a good reputation with abundant demand from outside the estate development. As a result the construction of a

new building was completed in January 2001 and inaugurated in September permitting to accommodate a total of around 220 pupils.

3.2.2. Construction and Design Sub-Contract

No commercial details released.

3.2.3. Financing Agreement – Loan agreement

The total cost of the project was £1 million. Financing was distributed as:

- The City Council contributed with £200,000, covered by the Central Government;
- The Private partner used £250,000 of their own funds;
- Corporate finance bank loan with the Royal Bank of Scotland over 10 years for financial leverage for the remainder of the financing.

3.2.4. Operation and Maintenance Sub-contract

Sewell Facility Management undertakes the day-to-day maintenance and repair maintenance.

Sewell Construction built the kitchen but doesn't provide catering which is perceived as being outside their skills. The provider is the Local Authority that already had this capacity and was keen to use it. Meals are prepared offsite and heated in the school.

3.2.5. Direct Agreement

No commercial details released.

3.2.6. Shareholders Agreement

No commercial details released.

3.3. LIFE CYCLE

The Life Cycle of The Victoria Dock Primary School PFI project (see Figure 2) started with the Kingston-Upon-Hull City Council Education Authority establishment of a Service Need for the provision of local educational services. As the Council had insufficient funding to undertake construction it considered the then innovative PFI route in the Education sector.

The standard procedures in a PFI require the development of a Business Case and the Public Sector Comparator (PSC). It followed the ITN and the nomination of Sewell Construction as the Preferred Bidder. It then took 12-15 months for the signing of the PFI contract to provide 25 years of educational services. Within this contract there is a further extension of 15 years for possible alternative usages of the land and building.

Operation started successfully in January 1999. It has built a good reputation and as a direct result of demands from outside the estate a new building was completed in January 2001 permitting the accommodation of more pupils. The contract ends 2039 and the assets are to revert to the Council free of charge.

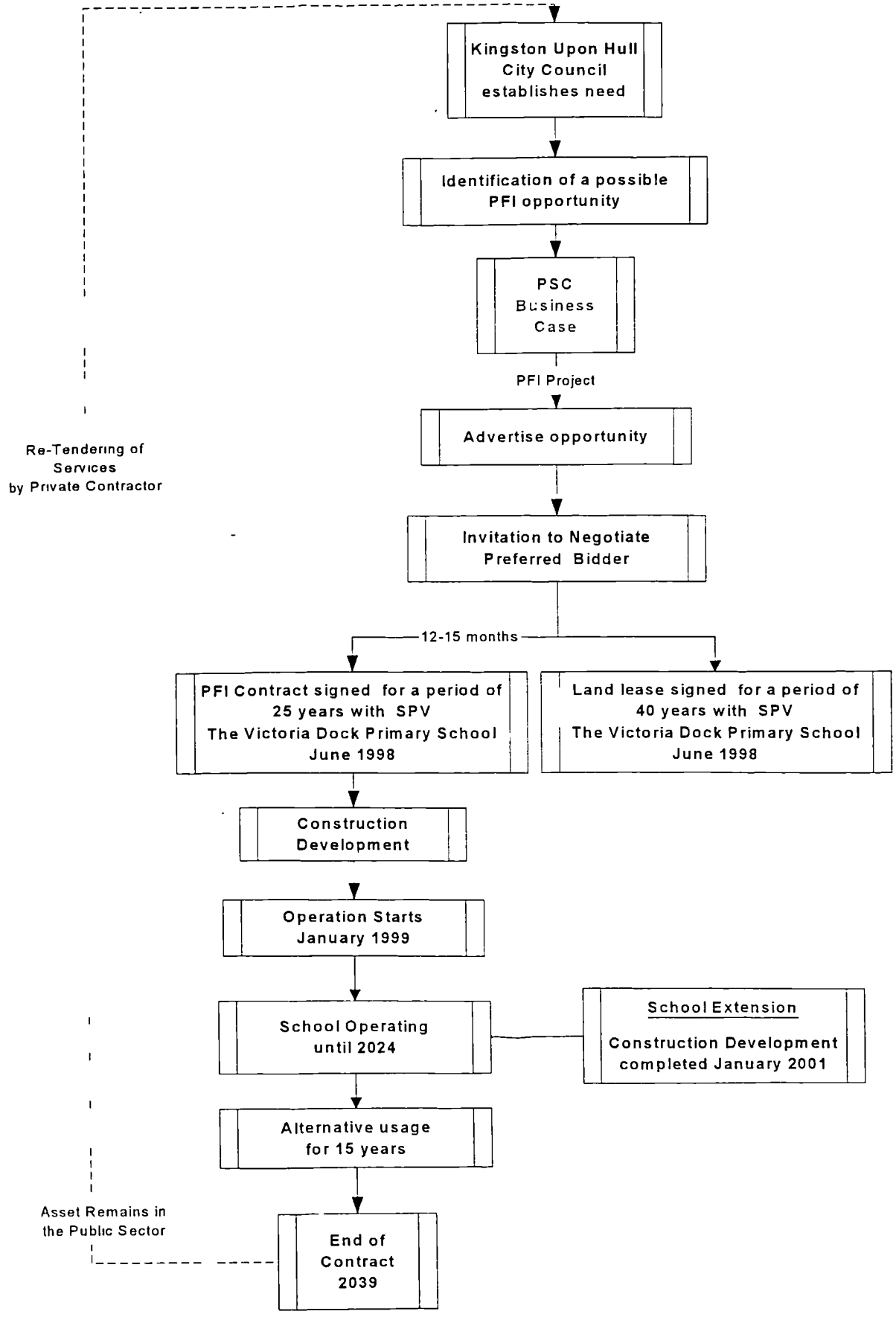


Figure 2. The Victoria Dock Primary School Life Cycle.

4. RISK TRANSFER

4.1. VALUE FOR MONEY (VFM) AND PUBLIC SECTOR COMPARATOR (PSC)

In the original UK PFI models the Government only approves the PFI financing scheme if it demonstrates that it produces Value For Money (VFM) when compared with the traditional methods of procurement. This means that PFI procurement generates savings to the public sector during the whole life cycle of the concession. This is done by comparing the contract costs with the Public Sector Comparator (PSC), which is calculated by costing what the public sector would have to pay to procure the construction, and the operation and maintenance of the school over the period of the concession.

To render the PFI project viable the City Council contributed £200,000; otherwise it wouldn't be possible to produce a favourable comparison with the PSC.

4.2. RISK ALLOCATION

The essence of PFI type contracts lies in the transfer of risk to the private sector. The underlying concept being that the risk is allocated to the party best able to manage it, and this results in costs reductions brought by about increases in efficiency and innovations introduced by the private sector.

The Victoria Dock Primary School PFI Ltd takes all the risks inherent to the concession, such as the Political, Regulatory, Economic, Financial, Social, Environmental, Legal, Bidding Construction and Design Risks. In these risk categories the main issues were related to bidding costs, as the legal costs were ten times what was initially expected (£50,000 instead of £5,000). The construction and design risks were minimised by adopting conservative design and construction techniques in which Sewell Construction had ample experience. The constructor even supplied all the materials, taking special care to use only those whose behaviour was well proven.

4.2.1. Commercial Risks

4.2.1.1. Project Specific Risks

As the contract is for availability of space there is no risk derived from demographic changes in the area.

4.2.1.2. Operation/Maintenance costs

The school has an insurance policy – hotel type – that covers the whole range of services. The school was designed to have low maintenance costs, paying special attention to reduce potential vandalism. For example they use external steel shutters (very uncommon in the UK) that although more expensive – higher initial investment and maintenance every six months - prove in the long run to be a good investment reducing (or stopping) the breakage of glass windows

As the school pays for their own gas and electricity great effort was made to design an energy efficient building (also not common in the UK). Some special features to reduce whole life cycle costs included are: double glazed windows, large cavity walls with air pockets to improve insulation, less expensive roof tiles that are replaced every 15 years instead of 25 years for the traditional aluminium foil, also they didn't insulate the concrete floor having considered that not much heat would escape thus saving the increased costs of insulation. Doors are painted (thus easier to repair) instead of varnished.

To reduce vandalism and for security and respective recurring costs they have put thick plywood to cover the roof thus preventing people breaking in. So far the only vandalism has been graffiti.

They have a security system sub-contracted to Prosegur.

To reduce costs and increase efficiency in maintenance the school has a multiskilled and flexible 'caretaker' with the authority (empowerment) to solve simple tasks, like fixing a plug. Training is also provided. For more complex maintenance problems, like breakdown of pipes, an external company has to be used.

4.2.3. People Risks

Paul Sewell had a very good and close relationship with the school's headmistress (was on a first name basis) and Sewell Group being a local company had traditionally good relations with the town councillors and the Education board.

Throughout the process a partnership approach was used, promoting co-operation between all the parties involved. The decision taken by Sewell to promote a 'Community Dividend' has enhanced this approach[4]. The Victoria Dock School PFI Ltd is to return a proportion of their profit to the community. As of 2000, it represented around £35,000 that went back to the school and was applied on special projects, like environmental – A Wildlife Wood was set up within the school grounds providing a wildlife habitat in a urban setting and an environmental focus for education.

4.2.4. Residual Value

The land and buildings is to revert, free of charge, to the council after 40 years.

[4] http://www.sewell-group.co.uk/pfi-base.html (accessed 21 November 2001)

5. KEY MESSAGES

- The Sewell Group went into the PFI market following a long–term strategy of return on investment. They invested mainly their own money (£250,000) recurring to traditional bank loans for financial leverage, and regard PFI as an opportunity for investment of their disposable cash. They go for low risk PFI projects (like schools) and expect to get a return on investment of an average 12-15% instead of 5% in bank deposits.
- The Sewell Group sees PFI as a strategy to smooth the cycles in the construction industry (usually ten years cycles). In times of depression for the construction industry the company has a secure revenue.
- The Sewell Group's involvement in PFI projects changed their attitude to business as they reckon that now they are more service oriented instead of asset oriented. Being responsible for the school's operation and maintenance made them look very carefully at whole life cycle costing.
- The Sewell Group is a strong advocate of small PFI projects for small companies, for example a school which can cost up to £5 million. It is important to promote simultaneously local involvement from the community and workforce. They always use local labour even when constructing outside Hull. It promotes local employment so important in depressed areas such as in Hull.
- Local involvement is also important in assuring good maintenance in non-centralized locations like Hull. For example, a big FM company would take too long to replace parts, like one day vs. one hour to replace a boiler.
- A partnership approach is always beneficial promoting co-operation between all the parties involved.[4] The decision taken by Sewell to promote a 'Community Dividend' from the profits of the SPV is an example of this approach.
- Joint Ventures are a viable solution when any of the partners doesn't have the financial strength to undertake the project. The Kingston Upon Hull City Council contributed with £200,000; otherwise it wouldn't be possible to obtain a favourable comparison with the PSC.
- Small projects undertaken by Municipalities are very sensitive to local social and economic environments. EC Harris, the consulting company, considers The

Victoria Dock Primary School PFI Limited as a 'Bad PFI' because it is very small, it was only possible because the headmistress pushed for it, and it was a 'local' deal – a local contractor owner of construction and facilities management companies. EC Harris considers that a big contractor could have done it cheaper (scale economies). This issue relates with the previous one, as effectively it was necessary to obtain a public partner's contribution to make possible a favourable comparison with the PSC. This raises the political issue of the social dimension of local authorities' small projects that require a delicate balance between local relations and strict profitability that in principle favours large companies with large economies of scale. On the other hand, in strictly 'local' projects there is always the possibility of inbreeding which is a danger to be avoided as it reduces efficiency.

- When 5-6 or more school projects are bundled the big companies are interested in bidding. One school PFI project it not interesting for them.
- A PFI contract in the education sector relieves technical staff from administrative and managerial job. The Head Mistress (Sue Roach) seems very pleased to concentrate only on educational activities. Her role in the school management is of a performance monitor. For example, if a lamp is not replaced within the pre-set period, a report is done and penalty points are given potentially affecting the unit price of the service thus affecting the revenue of the concessionaire.
- Previous experience is important. The Sewell Group had already constructed schools, and had a great deal of involvement and expertise in building maintenance and refurbishment in schools/hospitals. As a result, when Sewell decided to enter the PFI market they built upon their previous expertise and core business, adjusting their approach to a long-term perspective of operation and management. The focus on reducing maintenance and repair costs was a critical issue during project development; Sewell's being responsible for building maintenance.

Acknowledgements

The authors are grateful to all staff from the Sewell Group and The Victoria Dock Primary School PFI Ltd for their valuable contributions, opinions and assistance received in preparing this case study.

All opinions expressed in this case study are those of the authors alone.

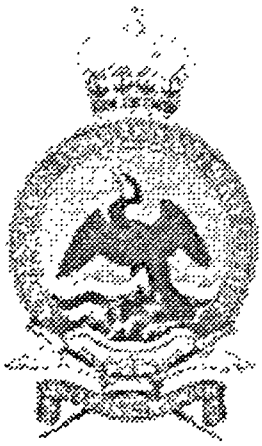
ANNEX IV

CASE STUDY

JOINT SERVICE COMMAND AND STAFF COLLEGE

PRIVATE FINANCE INITIATIVE (PFI)

CASE STUDY

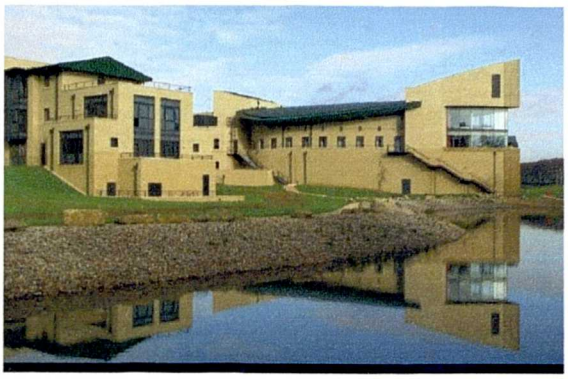


JOINT SERVICES COMMAND AND STAFF COLLEGE (JSCSC)

Teresa de Lemos

Joint Services Command and Staff College

Project Synopsis[1]



Title – Joint Services Command and Staff College (JSCSC)

Country – Watchfield, Wiltshire, UK

Project Cost – The construction contract was worth £88 million

Sector – Education – training staff officers of all three Armed Services

Status - Operational. Finance Agreement closed in 1998. Construction ended 6 September 2000

Sponsors - Concessionaire/Lead Manager – Defence Management (Watchfield) Ltd

Purchaser – Authority: The Secretary of State for Defence (Government Minister for Ministry of Defence – MOD)

Financing Package – Commercial Details not disclosed

Special Features – It was the first PFI scheme in the Defence Sector combining education and estates, including housing, training support services and mess accommodation support services

Brief - The PFI Contract, dated 5 June 1998 awards to Defence Management the design, construction, financing and the operation and maintenance of the JSCSC for 30 years. This College merges the educational activities of three services: Army, Navy and Royal Air Force. It provides command and staff training at junior, advanced and higher levels for all 3 services. The concession covers the academic teaching – military teaching is MOD's responsibility - management of classrooms, teaching theatres and offices, facilities for singles accommodation and 290 homes

The construction of the building was delivered on time, but the cost escalated from £88 million to £120 million at the expenses of the construction sub-contractor.

[1] All pictures are from the JSCSC web site http://www.jscsc.org.uk accessed 10 April 2001.

1. BACKGROUND – HISTORY AND OBJECTIVES

The creation of the JSCSC, located at Watchfield near Shrivenham, followed studies undertaken by the MoD and was according to the Chiefs of Staff of the three Armed Forces that wished to:[2]

- *Maximise the opportunities for the common understanding of the approach to warfare and defence as a whole, consistent with the increasing importance of the joint, combined, multinational and inter-agency nature of future operations;*
- *Provide the potential for future development of the Staff College on a combined and inter-agency basis.*

The establishment of the JSCSC involved the closure of the former Staff Colleges in the UK – the Joint Services Defence College and the Royal Naval Staff College at Greenwich, the Army Command and Staff College at Camberley and the Royal Air Force Staff College at Bracknell. The three Service Junior Divisions – Royal Navy Junior Division, Army Junior Division and Royal Air Force Junior Division – also moved to Shrivenham in August 2000, enabling all military command and staff training to be delivered from one site.

[2] JSCS web site http://www.jscsc.org.uk accessed 10 April 2001.

The decision as whether or not to make the JSCSC a PFI project was related with general policy procedures. The MoD has the policy that for every required output or service, the PFI route has to be explored and the decision to pursue as a PFI project depends often on the MoD capital expenditure requirement. MoD policy is that there is no declared minimum capital or contract value threshold level below which PFI need not be considered.

The initial location was to be Camberley but the concessionaire proposed Watchfield due to excessive costs. The criteria for site selection were: to be within 2 hours travelling from Whitehall (lots of people going back and forth), site cost, site extension (it needed a big site) provisions, possibility to be secure and the existence of local resources both during the construction and the operational stages when it employs about 250 civilian staff. The fact that there was a hospital nearby was also considered advantageous.

Construction and equipment of the buildings ended 6 September 2000. The official opening of the JSCSC at Shrivenham took place 28th February 2001.

The College has around 2200 students from the three Services considered to be the top 10% of the Armed Forces. Foreigners also attend the JSCSC.

2. THE BIDDING PROCESS

2.1. TIMETABLE

June 1997	MoD issued Invitations To Negotiate (ITN) to a select list of bidders
5th June 1998	PFI contract signed between MoD and Defence Management – An SPV for Laing & Serco.
May 2000	Construction of the College was far behind schedule and all efforts were put on its timely completion.
Beginning of August 2000	First time that construction completion on time looked feasible
6th September 2000	The college buildings already furbished were delivered to MoD
28th February 2001	JSCSC officially inaugurated.

2.2. PROJECT MANAGEMENT

2.2.1. Project Team

The MOD set up one of the best client Project Management teams that Defence Management had encountered with sufficient empowerment and execution decision powers. In contrast a young and inexperienced manager led the team from Laing Construction.

2.3. NEGOTIATIONS

An Industry Briefing Day was held to provide the interested companies with sufficient information to enable them to make an informed decision on whether or not to bid. Topics[1] typically covered were: background information, how the service is currently

[1] MoD 2001, *The phases of a PFI project – procurement*, http://www.mod.uk/index.php3?page =356 (accessed 7 May 2001).

being delivered, the service requirements, the project timetable and other sources of further information.

The MoD's usual procedure is to filter the number of potential bidders through Pre-Qualification Questionnaires and Invitations to Submit Outline Proposals. JSCSC ITNs were issued June 1997 to a selected shortlist of bidders. The concession contract was signed with Defence Management in June 1998.

2.4. DUE DILIGENCE

The details were not made available.

2.5. DEBRIEFS – COMMUNICATIONS

The MoD follows the Public Procurement Regulations[4] under which companies are entitled, on request, to a debrief on the reasons for their non-selection. The MoD also offers the opportunity to both successful and unsuccessful bidders of a debrief covering all aspects of their submission. The main purpose being the quality improvement of future submissions.

3. THE CONCESSION

3.1. MAIN PARTICIPANTS

3.1.1. Authority

The Secretary of State for Defence acted as the Government connection with the Ministry of Defence – MoD.

3.1.2. Contractors – Special Purpose Vehicle (SPV)

Defence Management - Watchfield Ltd. The shareholders are:

- Serco (50%), facilities management company and the operation and maintenance service provider for JSCSC. They run scientific establishments, maintain buildings, run leisure centres, railways, etc.
- Laing Investments(25%)
- Laing Hyder plc (25%), a specialist company set up to invest and manage PFI projects. The shareholders are Laing Investments and Hyder Investments

John Laing plc has three business areas besides the Construction Division. The corporate structure and interrelationships for JSCSC is presented in Figure1.

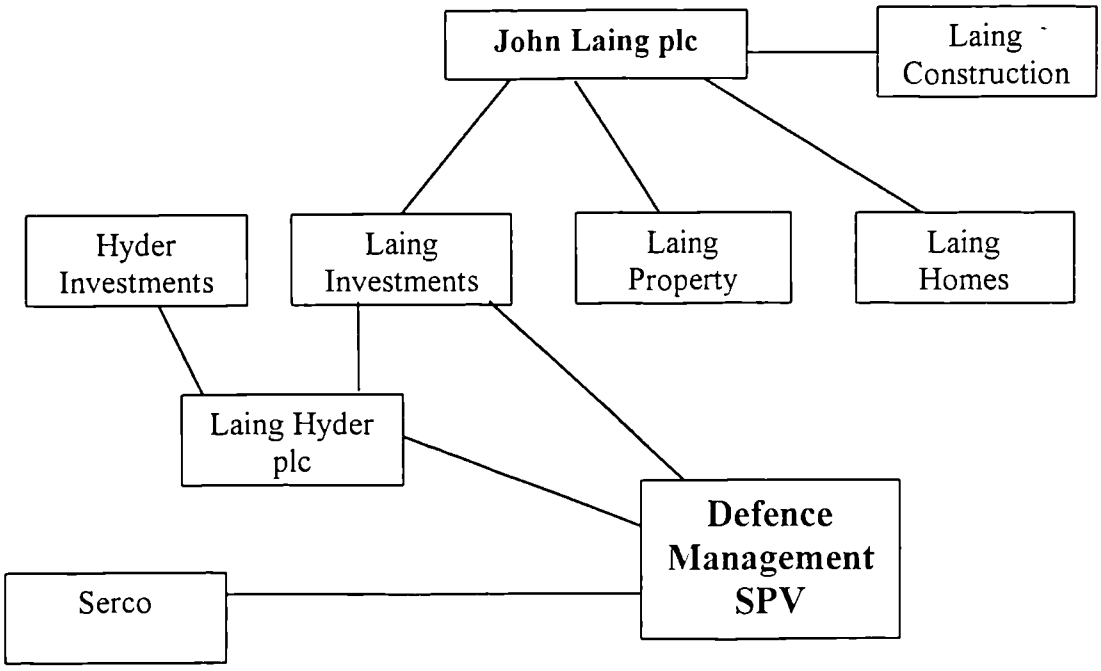


Figure 1. Corporate interrelationships for Defence Management shareholders.

3.1.3. Construction Sub-Contractor

Laing Construction Ltd (L.C.) owned by John Laing plc.

3.1.4. Operating Sub- Contractor

Serco Aerospace Ltd

3.1.5. Senior Lenders

Royal Bank of Scotland (RBS). The RBS also acted as the "Security Trustee" and Senior Agent" in the Direct Agreement.

3.1.6. Consultants

Consultants of I.C.:

- Technical
  - Watermans - Waterman Partnership Holdings plc is an international multi-disciplinary consulting engineers firm providing professional advice and design services in civil, structural, mechanical, electrical and power engineering together with all aspects of environmental engineering and project safety planning. The Group has in excess of 730 staff and an annual turnover of £30.3 million.
  - Over fifty specialised companies were sub-contracted by L.C. during construction.

3.2. CONTRACTS

The contractual structure is indicated in Figure 2. In total 30-35 different firm agreements were involved.

3.2.1. Concession Contract

The PFI Contract, dated 5 June 1998 awards to Defence Management the design, construction, financing and the operation and maintenance of the JSCSC for 30 years. This College merges the educational activities of three services: Army, Navy and Royal Air Force. It provides command and staff training at junior, advanced and higher levels for all 3 services. The concession covers the academic teaching – military teaching is MOD's responsibility - management of classrooms, teaching theatres and offices, and facilities management of singles accommodation and 290 homes.

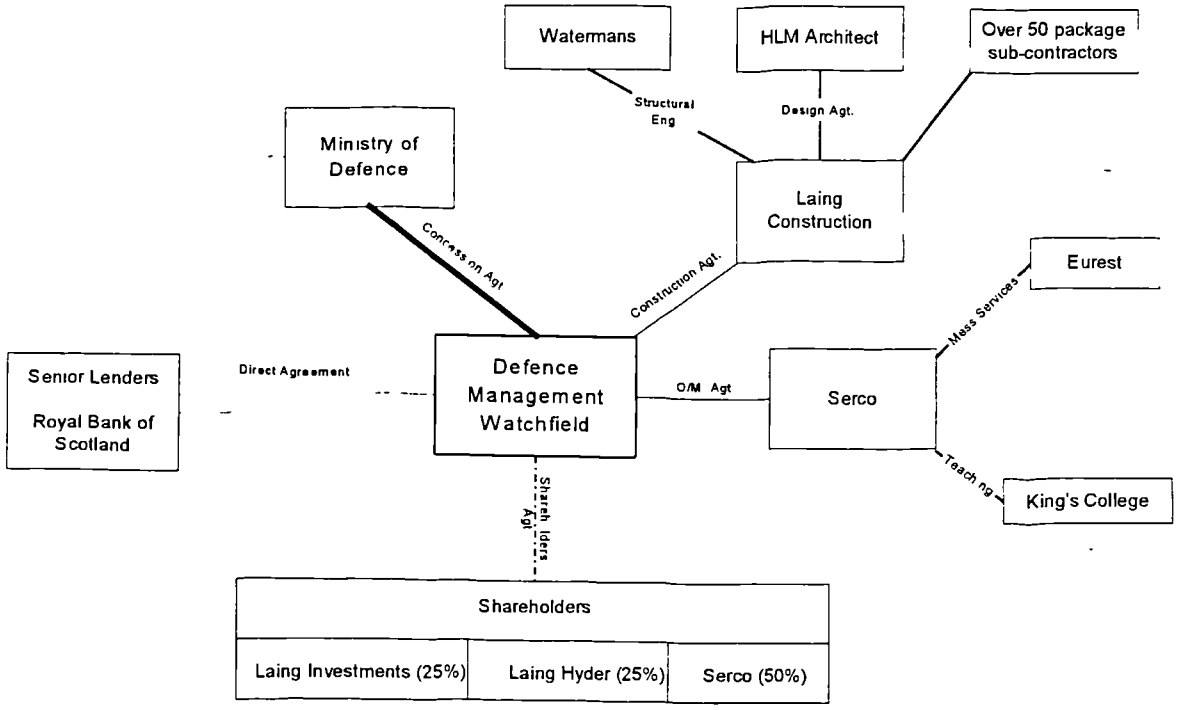


Figure 2. JSCSC Contract Structure.

The concession contract has 52 clauses that constitute the main contract are relevant to either Construction or Service Provision. There are also 28 schedules:

Schedules

1. Definitions
2. Execution Documents
3. Collateral Documents

4. Land Matters
5. Construction Matters
6. Transfer Requirements
7. Equipment and MoD Property
8. Service Requirement Specifications and Method Statements
9. The Financial Model
10. Variation Procedure
11. Provisional Employee List
12. Custody Agreement
13. Review Procedure
14. Not Used
15. Performance Monitoring System
16. Availability Deduction Mechanism
17. Insurance Requirements
18. Payment Provisions
19. Record Provisions
20. Form of Funders Direct Agreement
21. Dispute Resolution Procedure
22. Certificates
23. Compensation on Termination Provisions
24. Services Mobilisation Requirements
25. Corporate details of the PFI contractor and its Holding Company
26. Market Testing Procedure
27. Not Used
28. Third Party Revenue

Schedule 5 is the most important document for construction. Schedule 13 – Review Procedure caused difficulties for construction. Schedule 6,7,8 and 24 are the most important documents for Serco, along with 15 and 16, which were reviewed by Serco.

3.2.2. Construction Sub-Contract

The construction sub-contract was a Guaranteed Maximum Price (GMP) contract between Defence Management and Laing Construction worth £88.85 million, and fixed term 113 weeks. The construction phasing had 8 defined stages with 102 defined work packages.

Laing Homes was sub-contracted by L.C. to build the residential area of JSCSC.

3.2.2.1. Design Sub-contract

Architectural design was by HLM Architect and Structural by Watermans, together with package sub-contractors: M&E, Roof Cladding, Internal Partitions, Atrium Glazing etc.

The MOD wanted to make the JSCSC a flagship project, so the projected image was a key issue. Design should have visual impact, emphasize the status, be aesthetic and also functional.

The chosen design is modular, i.e., repetitive to reduce costs. The materials used are proven ones to reduce risks.

3.2.3. Financing Agreement – Loan agreement

Commercial arrangements not released.

3.2.4. Operation and Maintenance Sub-contract

The Operation/Management (O/M) sub-contract was signed between Defence Management (Watchfield) Ltd and Serco and aims at procuring the facilities management equipment, to recruit the staff and put in place a facilities and task management for the Support Services for the College. In total the SPV's initial investment was £5.8 million. It is a fixed price contract over 30 years, and represents a general gross income of between £5 million-£10 million (£8 million most probable) a year paid monthly. Each service is paid monthly against performance criteria with typical monthly incomes from £10,000 to £200,000/month, with deductions being made where performance has failed to meet the correct levels. Each service will have a range of six deficiency bands with deductions ranging from 0% to 20% of income against each band.

The O/M sub-contract covers four main business areas:

- **Teaching** –The War Studies Group in the School of Humanities at King's College London, is sub-contracted by Serco to carry out the Academic Support Service. The contract's duration is 10 years. The Group provides a Dean, 45 lecturers and support staff to deliver teaching in War Studies. The

team includes over 38 on-site academic staff linked to the Department of War Studies, based at King's Strand Campus [2]. Taken together with the University of London's Centre for Defence Studies, also based at King's, the grouping will be the largest academic defence studies entity in Europe. The Defence Studies Department at JSCSC objective is to be a centre of excellence for teaching and research in defence studies. It has also a Military Directing Staff working together in team teaching with the academics.

- **Training Services** – Serco carries out the

  - *Library* (the second largest War Studies library in the world combining the volumes of the three libraries – Army, Navy and Air Force);

  - *IT Services* for both hardware and software (the majority of the software was specially developed by a consultant, and it controls the quality system within the College);

  - *Audio Visual* - Serco has 7 personnel controlling the classrooms, syndicate rooms and 8 major lecture theatres with a capacity ranging from 800 to 40 persons. CCTV and TV cameras interconnect the theatres and a lecture can be simultaneously transmitted to all;

  - *Training Resources* covers all the resources related with the teaching activities like secretarial, administrative, graphics, photography, photocopying, sports and travel.

- **Estates** - Serco carries out the Security, Facilities Management and Estate Management Services. Provides all the grounds and buildings maintenance for the 100 acre site, containing some 45 000 sq metres of College, 290 Family Quarters, and sports pitches including 2 cricket grounds, an all weather hockey pitch, tennis courts, a rugby and football pitch as well as squash courts and a fitness suite

- **Mess Services** – Serco sub-contracted Eurest to carry out Catering and Cleaning Services. The catering is prepared for 650 persons/day and must also serve 450 people on a silver service dinner.

[2] King's College London 2001, £20m contract for academic teaching at new military staff College, http://www.kcl.ac.uk/about/news/ni/actrmist.html (accessed 27 April 2001).

Serco employs a staff of over 300. Within the organisational structure there is a specialised Department on Quality Health and Safety that abides by the ISO 9000. It is expected that the Quality Manuals will be finished by August 2001.

3.2.5. Direct Agreement

The Direct Agreement was signed between the Secretary of State for Defence (the Authority), the Royal Bank of Scotland (Security Trustee and Senior Agent), John Laing Investments Limited (Mezzanine Agent) and Defence Management (Watchfield) Ltd (PFI Contractor). Under this agreement the Access Licence may be re-granted to another entity put forward by the Security Trustee.

3.2.6. Shareholders Agreement

Commercial arrangements not released

3.3. LIFE CYCLE

The Life Cycle of the JSCSC PFI Project (see Figure 3) started with the MoD's establishment of a Service Need for the provision of joint educational services to the three services of the Armed Forces, following the decision of the Chiefs of Staff to integrate these services to accommodate the needs of modern warfare.

The next steps were to assess if the project was appropriate for a PFI route. So a Business Case and the Public Sector Comparator (PSC) were developed.

After the decision was taken to go for a PFI, the project followed the usual procedures established in MoD's policy. Presentation of the project, holding an Industry Briefing Day, Invitation to Negotiate to a group of selected bidders in September 1997, and finally announcement of Defence Management as the preferred bidder.

The PFI contract between the MoD and Defence Management was signed 5th June 2000, and construction started. The buildings including their respective equipment were delivered the beginning of September 2000. It then follows a period for the service provision.

The PFI Contract ends 2028, and the services will either be re-tendered or will revert to the MoD.

The assets reside with DM until expiry of the concession period. At that point the assets revert to MOD at zero capital transfer cost. Should the concession be ended prematurely an asset capital transfer reservation clause comes into force, by which MoD have the exclusive rights to purchase the asset at a sum reflecting the remaining concession period (Various sub-clauses are enacted if termination of the concession is due to either default by the concessionaire; or by changes in statutory requirements of Government).

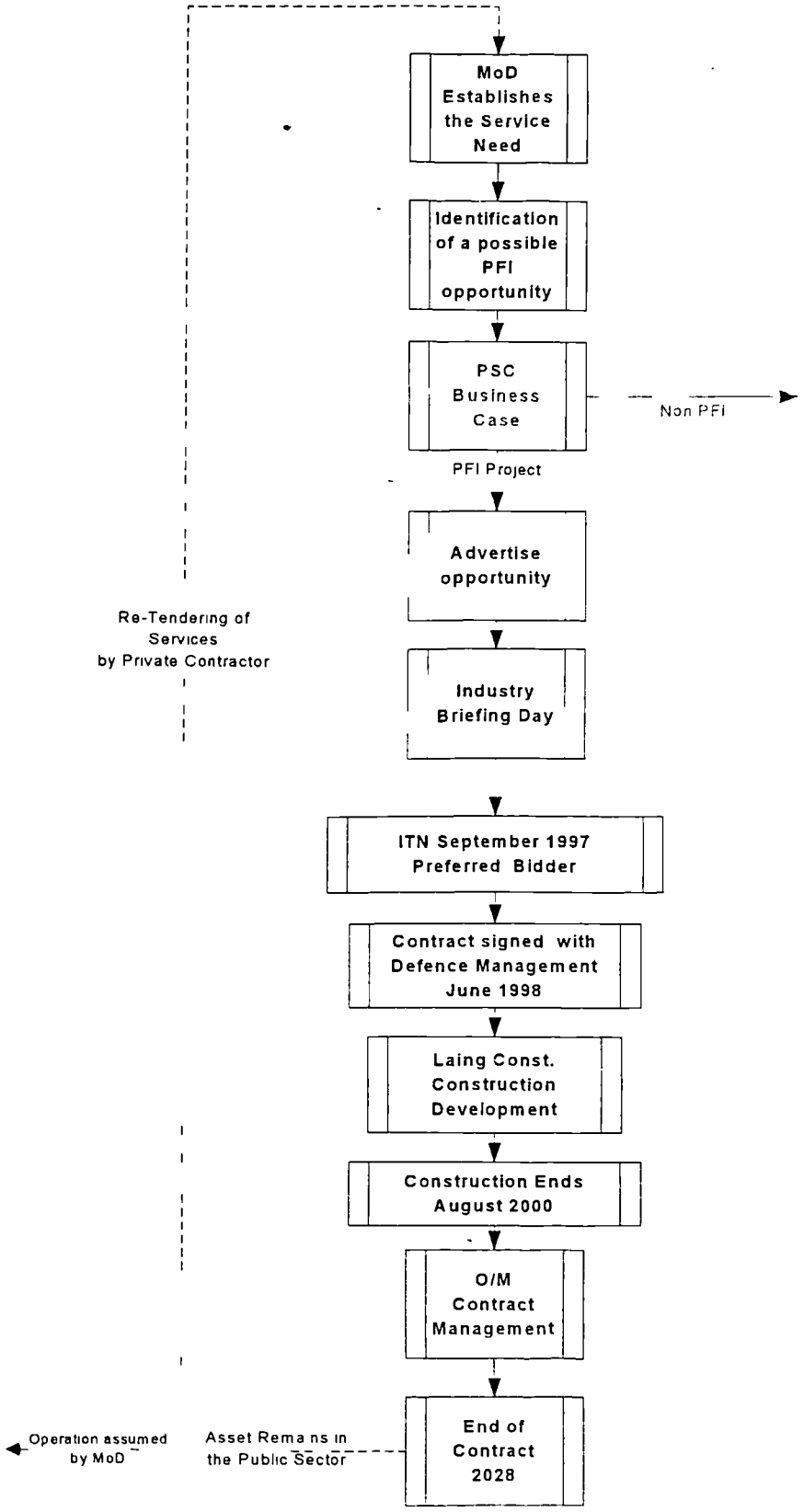


Figure 3. JSCSC Life Cycle.

3.4. VALUE DELIVERY NETWORK

3.4.1 Value Chain

The Value Chain's model introduced by Porter (1985)[3] segregates a firm into its strategically relevant activities to better understand the behaviour of costs and potential sources of differentiation. Every firm is considered as a collection of activities performed to design, produce, market, deliver and support the product/service. The value chain identifies the strategically relevant activities that create value and cost in a specific business.

Value chain analysis is a tool designed to assess the firm's competitive advantage vis-à-vis its competitors. It is not suited for industries since it would be too broad and important sources of competitive advantage, and differentiation that can only be applied to a company will necessarily be obscured. Differences among competitor's value chains are a key source of competitive advantage. The firm's task (Kotler 1999) [4] is to examine its costs and performance in each value-creating activity and to look for ways to improve it. The firm must also estimate its best competitor's costs and performances and establish them as benchmarks. To the extent it can perform certain activities better than its competitors it can achieve a competitive advantage.

3.4.2 Value Delivery Network

The firm's value chain combined with the one from suppliers, channels (distributors, customers), and the links between all value chains is designated the **Value-Delivery Network**. Value is created not only within the company but also throughout the network involved in a project, that is, the value chains of all the stakeholders involved. Competition is therefore between networks, not firms. Consequently the competitive advantage derives from the better network and not exclusively from the firm's own value chain. In a PFI project, there are numerous stakeholders involved in value creation, the **Value-Delivery Network** encompassing the value chains of all the stakeholders. The model of a PFI value-delivery network gives a good and clear picture on how value is created. An analysis of the JSCSC Value Delivery Network follows.

[3] Porter, M.E. 1985, *Competitive Advantage; Creating and Sustaining Superior Performance*, Free Press.
[4] Kotler, P. ed. 1999, *Marketing Management*, 10th Ed.

The Stakeholders in the JSCSC are:

- Authority – MoD;
- Contractor - Defence Management;
- Finance - Senior Lenders – Royal Bank of Scotland;
- Construction Sub-contractor – Laing Construction – Watermans, HLM and package sub-contractors;
- Operating / Maintenance Sub-Contractors – Serco – King's College and Eurest;
- Suppliers;
- Insurance;
- Users;
- Technical consultants;
- Accounting consultants;
- Legal consultants;
- Financial consultants;
- Auditors (like the National Audit Office);
- Political / Regulatory Issues;
- Environmental / Social Issues;
- Labour Issues;

Figure 4 presents the JSCSC Value-Delivery Network. It includes all the stakeholder's value chains together with their respective inter-actions. The bold arrows represent the most important connections that form the essence of the PFI contract. The thin arrows represent other eventual contractual relationships that are not intrinsic to the PFI contracts, mainly with consultants. The dotted arrows are possible influences that might occur, that is, connections that are always present in a PFI, not included in any contract, but that very often play a key role in the project's development.

In the centre are the main players: the Authority – MoD - and the Contractor – Defence Management - surrounded by the other stakeholders. These can be connected with one or both main players. For example, in the figure several stakeholders connect directly

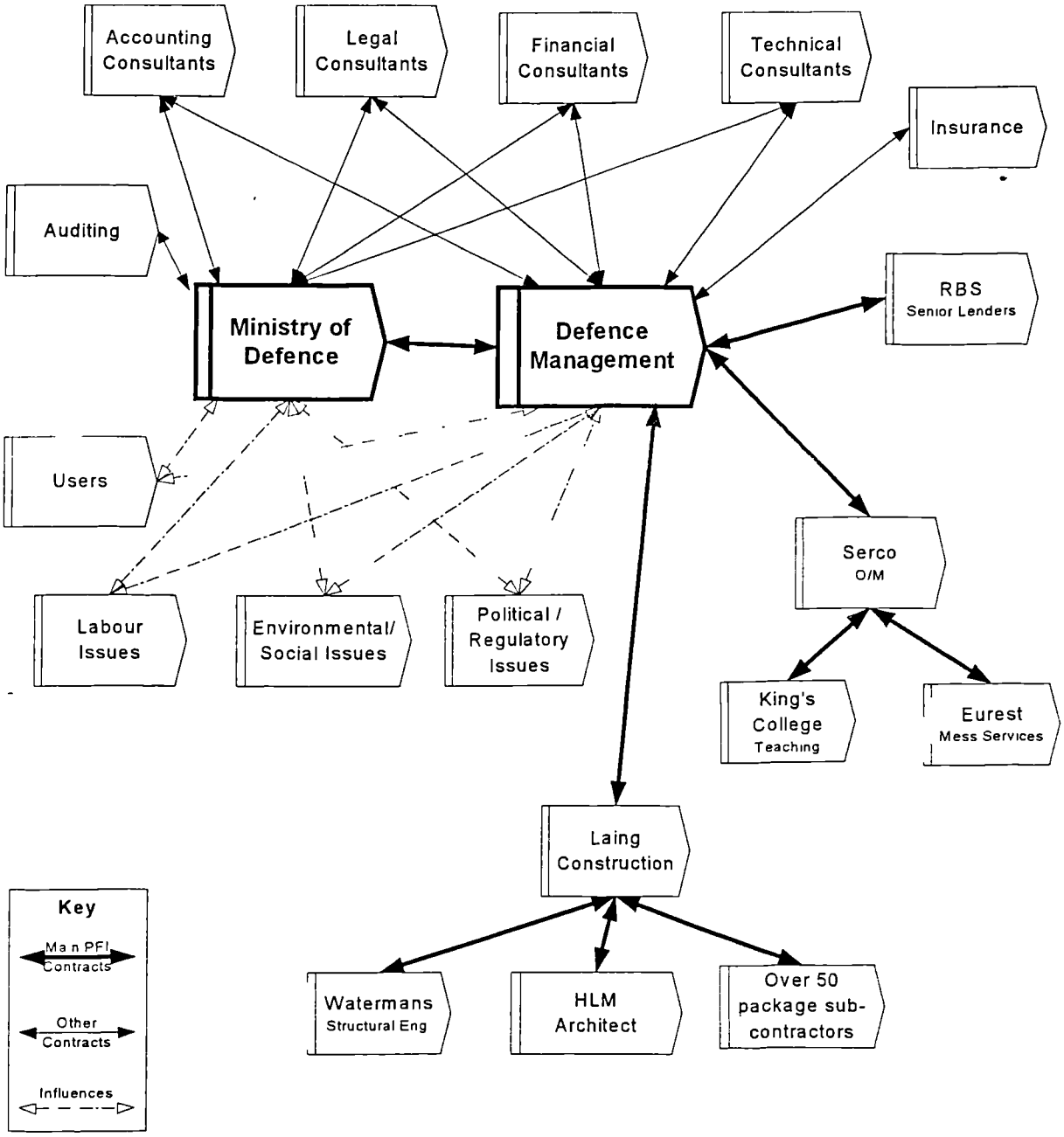


Figure 4. JSCSC Value Delivery Network.

only the Contractor like Sub-contractors, Senior Lenders, Insurance, and Suppliers, etc., similarly Auditing is only directly connected to the Authority.

Although all the consultants are connected to both the Authority and Contractor, they are not the same for each one. This simplified representation was chosen so as not to overburden the figure with, for example, the duplication of all the consultant's value chains.

The problems that arose during construction derived mainly from a poor interaction of L.C. value chain with the others to which it connects directly. Figure 4 presents how the section of the value-delivery network centred on L.C. should have inter-acted. Figure 5 presents the reality during construction. The connections between L.C. and both Defence Management and its sub-contractors were very loose (or nonexistent). To make matters worst HLM wishing that this building would be a flagship project, established a link with MoD and would feed into the MoD the requirements that MoD would in turn impose on L.C.. Both MoD and HLM would press L.C. so much for certain specifications that L.C. would finally concede.

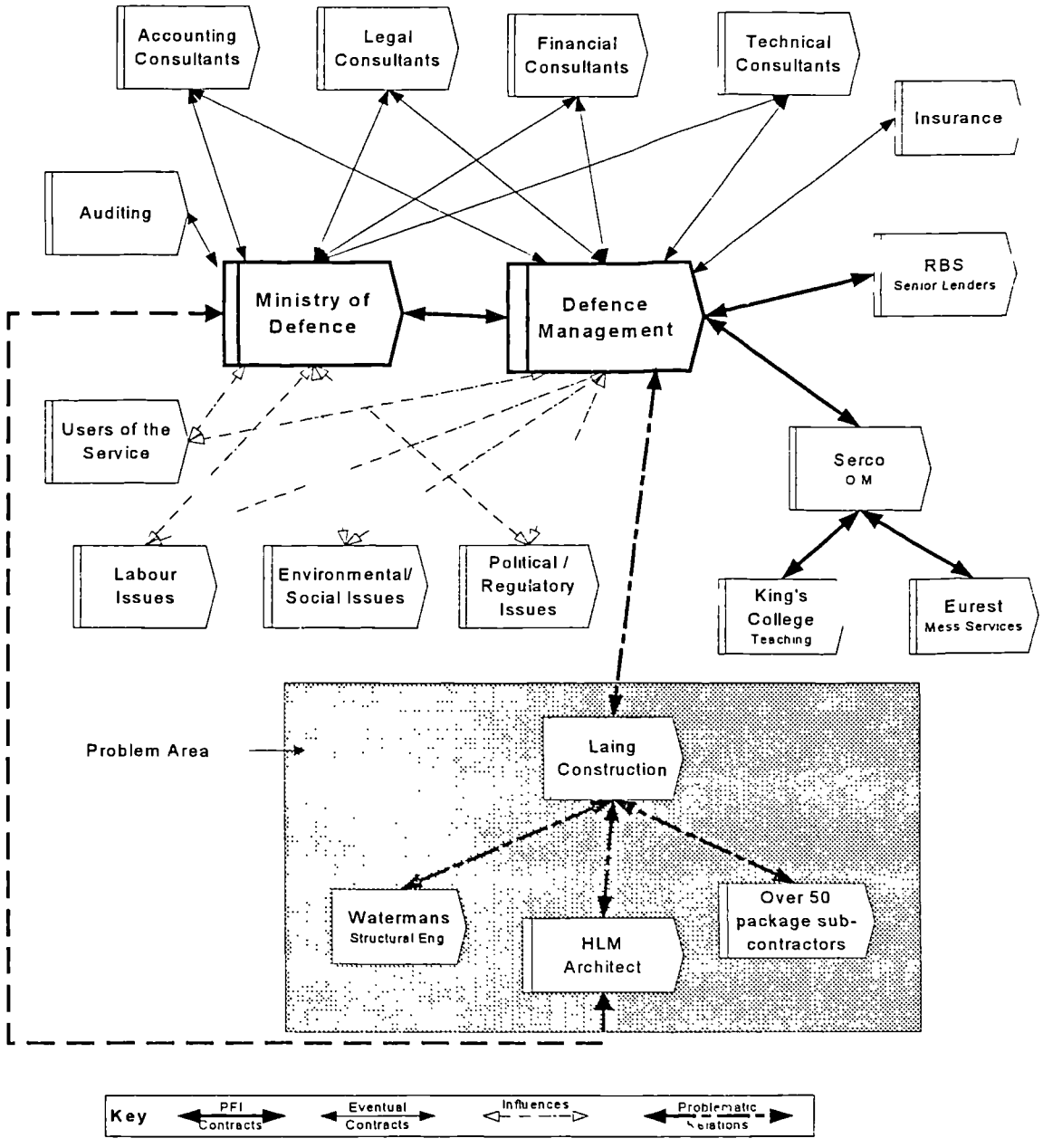


Figure 5. JSCSC Value-Delivery Network in reality.

4. Risk Transfer

4.1. Value for Money (VFM) and Public Sector Comparator (PSC)

According to governmental guidance for a project to proceed by the PFI route it must demonstrate that it produces Value for Money (VFM) when compared with the traditional methods of procurement, i.e., it generates savings with the taxpayer's money. To demonstrate the savings, the project's cost is compared with the Public Sector Comparator (PSC), which is calculated by costing what the public sector would have to pay to provide the same service over the concession's period.

In the JSCSC project the PSC was worth £68 million. The project cost was estimated at £88 million but in reality construction costs escalated to £120 million. The public sector clearly got a good deal because now they own (or will own) a building at a fraction of its cost.

4.2. Risk Allocation[5]

The following sections describe the most relevant risks that proved to have had an adverse effect on the development of the JSCSC PFI project. The main purpose of this case study is to analyse and draw lessons for the construction companies involved in a PFI, so necessarily the risks that are presented are centred in the bidding and construction stages. As Service Provision has been going on for a short period without any relevant problems mainly due to the strict monitoring system installed, a description of this system is also presented.

4.2.1. Political and Regulatory Risks

Political advice - The JSCSC was a Government's flagship project so it was very susceptible to state-of-the-art good industries practices like the *Zero Defects Initiative* that was introduced as a political advice from Department of the Environment Transport and the Regions and the *Partnering Initiative* the political advice from the Construction

[5] This section draws on interviews and Eaton D. 'SLEEPT Factors Analysis for PFI Projects' the paper presented at the conference The experience of PFI in the UK and Project Finance in Portugal, Lisbon, 19th January 2001.

Best Practice Program. The Zero Defects Initiative is related with construction quality and aims at no defects, while the Partnering approach is related with the project's procedures. *Partnering* can be defined as [6] *'a long-term commitment between two or more organisations for the purpose of achieving specific business objectives by maximising the effectiveness of each participant's resources. The relationship is based on trust, dedication to common goals and an understanding of each other's individual expectations and values. Expected benefits include improved efficiency and cost-effectiveness, increased opportunity for innovation, and the continuous improvement of quality products and services'*. These requests aim at getting a better project, which is fundamentally good, but can constitute a risk for companies not familiar with these management techniques.

Client change – During the negotiations there was a restructuring of MoD that affected the normal procedures. The risk was that the changes in MoD personnel would bring idiosyncratic changes to the project objectives. The personal interpretation of prior agreements could change either the scope or content of the project, etc.

Planning regulations surprises – At the time of the signing of the contract Laing Construction assumed that the construction was approved by the Local Authority Planning Department and had the construction works ready to start when they were informed that the building would only be approved if was 2 meters deeper than planned. The immediate major adverse consequence was that the building's foundations reached a very bad soil instead of rock as planned, and consequently costs escalated.

4.2.2. Economic and Financial Risks

The O/M sub-contract is a fixed price over 30 years; as such inflation is the most important risk at which the project is subject to.

4.2.3. Social Risks

Impact in Local Infrastructure – For example, there was only one Army Pub, now there is a Navy pub too. New schools were also needed.

[6] McDermott, P. & Charmer, K. 2001, 'Partnering within PFI projects' paper presented to the conference The experience of PFI in the UK and Project Finance in Portugal, Lisbon, 19th January.

4.2.4. Environmental Risks

Flood Water - The JSCSC was built to withstand an event that would occur 1:100 years (once every hundred years), i.e., exceptional one. Unfortunately the rains in the winter 2000 were a 1:200 event, which caused all sorts of problems namely: flooding in the ground floor of the main building and the lagoon's overflowing in spite of the drainage installed (it was supposed to overflow to a creek).

Contamination – The 1:200 event caused mains sewerage from site (and also off-site) to overflow into the containment lagoon. This lagoon (also a landscape feature) was then required to be pumped dry, its previous stone lining removed, the whole cover decontaminated and then relined with a new stone lining and then refilled. All at no additional cost to the SPV/client and at the expense of John Laing Const.

4.2.5. Legal Risks

The concession contract (and 28 schedules) became an implied document in the construction contract. Therefore the requirements of untried/untested PFI concession became an implicit feature of all contractual negotiations. The full implications of the implied terms where not recognised in GMP. Hence the reason for constructors costs escalating from £88 million to £120 million with no change in GMP.

4.2.6. Bidding Risks

The information brief was considered by L.C. to have been too poor, too loose, leaving too much room for interpretation to the lead designer. The consequence was that the contract was signed with inadequate information to correctly budget the construction works.

4.2.7. Construction Risks

Planning and Construction approvals – Traditionally UK Government Departments have been exempt from Local Authority Planning Approval Procedures (Although by custom and practice they have tried to comply).

The implementation of the Humans Rights Act (HRA) (1998) and its application/commencement in October 2000 gives local citizens a statutory right of appeal against infringents of personal rights/freedom. There is a strong body of legal opinion that Government bodies (and by implication their agents such as Defence Management) cannot interfere with their rights by claims to Crown Immunity, as was previously done.

Therefore any "local" complaints about planning and/or Construction Approvals could potentially lead to a claim under the HRA (1998).

No contingency/remediation from actions was contained in the contracts and therefore liability for compliance following any such action would be at the cost of the concessionaire or constructor.

To date there is no knowledge of any action. However, social risks; for example the temporary shortage of school places; could lead to action against the MoD and their agents, DM, etc. There are currently no legal directions as to the liability for actions under HRA (1998). Therefore DM has an unknown potential liability.

Site conditions - One of the main problems that L.C. encountered related to the site conditions is related to Ground water. Bad ground and excavations below water table occurred in excess of all reasonable expectations at tender stage. The 1:200 floods caused a significant alteration in ground water levels and ground water content.

The requirement to deepen excavations for foundations by a further 2 metres increased the volume and technical complexity of earthwork and sub-structure activity. L.C. having agreed a GMP with the concessionaire did not lay-off its risk to their sub-contractors. The construction sub-contracts were largely "traditional" and allowed sub-contractors to send and obtain reimbursement for variations in the works.

Poor drainage - One of the main problems encountered was poor drainage after the heavy rains of the first winter after delivery of the building. This might be related to the alterations requested by the planning departments to lower the building 2 metres. It happened that L.C. had already built the drainage network before knowing of the

alteration, and although they were removed on paper as the pipes were already in place actually they were not removed, which might have caused the flooding of the building.

An example of trying to comply with planning requirements: The documentary evidence was amended to suggest compliance whilst the physical works (already executed) were not amended. If this should cause local flooding problems in the future, there is the possibility of an action under HRA (1998) by "local residents".

NB: These "local residents" could even be the occupiers of the military family homes on site, who historically have been unable to take any actions against MoD (and agents) because of claimed Crown Immunity. Once again DM have an unknown potential liability.

Structural problems – It has been noted that there is evidence of the existence of major cracks along the expansion joints. This might be related to the bad soil conditions were the building stands. DM has the liability for this potential defect.

Co-ordination problems - There were sequencing and programming difficulties, that for example, led to the scaffolding sub-contract in the final account amounting to plus 87% over tender, that is £560,000 in excess of L.C. estimate.

Labour shortages - L.C. experienced serious labour shortages, as the Swindon area is very buoyant with few people available that can be employed as carpenters, electricians, etc.

Latent Defects - After delivery there was a 3 months period of snagging to correct construction defects. A final inspection will be performed one year after delivery to assess if all defects were corrected. There is a period of 12 years during which L.C. will be liable for latent defects.

All the problems encountered means that the GMP of £88 million, would in reality cost L.C. £120 million.

4.2.8. Design Risks

Insufficient specifications - At the start of construction only 5% of the drawings were available. Their quality was poor, impossible to estimate from effectively, which was problematic since the construction contract was budgeted according to the philosophy of

GMP, and this methodology to be valid requires the assurance of ~80% of the design of what is going to be built. But at the time of signing the JSCSC construction contract not even 50% of the design was known, making it impossible to budget correctly. Even the materials choice was done as construction progressed; for example, it happened that, as image was a big issue L.C. was forced to use walnut for the doors instead of a cheaper material.

Poor design procedures – Laing devised the Review Process themselves but it proved to be very bad for the progress of the construction works. It introduced delays because construction could only start when there were no comments from every partner. The Review Process was an iterative process with the following stages:

- First, HLM architects produced the drawings;
- The drawings were sent to a review committee composed of: MOD, Serco, planning and building control. They had 20 days to comment;
- The drawings were redone and resubmitted to the committee;
- This process would repeat itself until there were no comments.

But *"No comment"* didn't mean, *"I agree"*, which meant that later problems could surface. Effectively, it happened that long after construction commenced problems were raised. For example, there was only one overworked planning officer in the municipality, who although issuing a *"No comments"* would raise issues long after because it was then that he had time to analyse the drawings. Also the fire department stated afterwards that construction was not in accordance with safety regulations: the corridors wouldn't withstand 1 hr. (only 30 min) which was in contravention of regulations, that state that rooms have to withstand a fire for 30 min, corridors 1 hr. and other places 2 hr.

The usual way to proceed is to present the drawings for comments, and after receiving comments proceed with construction.

Designs were not timely - Often the plans were revised, with the annotation that there were only minor alterations, which in reality would mean alterations in 50 items. Schedule revisions were constant, which was very disturbing because it was a tight schedule as L.C. had to deliver the building already equipped on 6 September 2000. Otherwise it would mean a one-year delay in starting operation, as the academic year would be lost. Design evolution was accompanied by panic control, which can be explained by how the progress in drawings delivery was (illustrated in Figure 6). The

difference between the ideal delivery schedule and as it was in reality is great. The construction sub-contractor had the majority of the drawings in his possession only near the end of the construction period, whilst its delivery by the designer should have been smoothly phased from the beginning of construction.

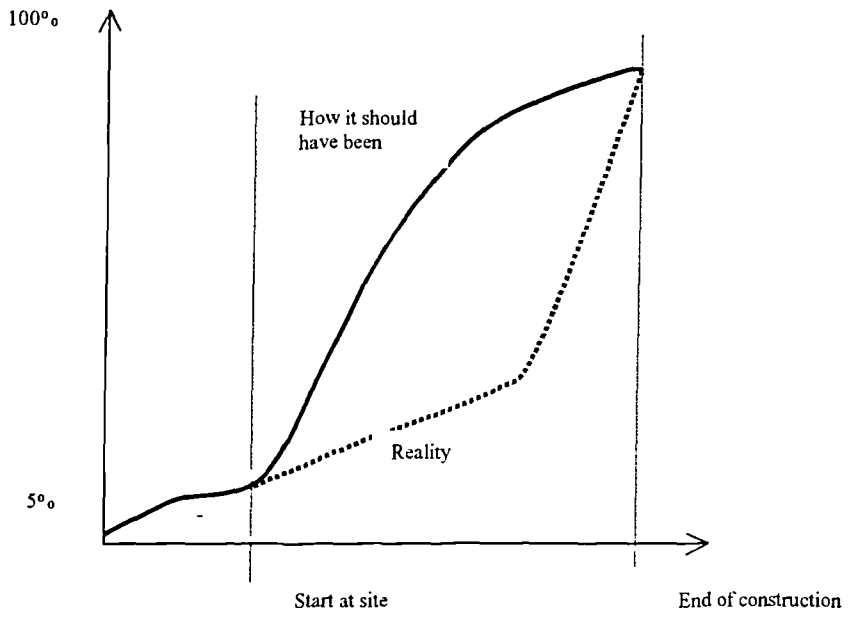


Figure 6. Progress in delivering the drawings.

Service Specifications - *"Fit for purpose"* was introduced in the construction sub-contract to characterise the service specifications of some construction items. It proved to be the origin for several problems, because the purpose can change depending on the client's point of view. The most striking example is the 'Fit for purpose' of a fire escape: outside the bar there is a fire exit with a balcony and stairs to the ground. It happened that during the commemoration of Victory in Europe (VE) Day people who were at the bar, went out to see the planes flypass and the excessive weight caused the balcony to bend. It was designed for people to pass through not to stand, but as it didn't prove in that particular circumstance, L.C. was forced to redesign it and rebuild it as it was "not fit for purpose". It is important to note that the concept of *'Fit for Purpose'* is uninsurable, no one insurance company will accept to cover this risk, and it is the constructor that takes the risk not the designer.

4.2.9. Commercial Risks

4.2.9.1. Project Specific Risks

Staffing Problems - The Mess Services – catering and cleaning – were sub-contracted to Eurest. At the beginning of operation Eurest had big problems with staffing. The area where the JSCSC is located is 3000 short in labour positions (i.e., in the area there is an average of 3 000 employment vacancies). Eurest had underestimated the problem and as such it caused major problems with the performance monitoring system. According to this system if the agreed levels of performance are not attained Serco's payment by the MoD is penalised. The turnover of the personnel was excessive – few stayed for longer than 2 weeks - and staffing was further complicated by the need of being security cleared – an average 50% wouldn't pass.

So far Serco has not been financially penalised, and having opted for a partnering approach they worked in conjunction with Eurest to work out the best solutions. One year after service commencement this problem has been reduced, performance has improved and Eurest has managed to get a good set of supervisors. Currently Eurest employs 160-180 persons, probably needing a further 10-12. They get employees from as far as Oxford (30Km).

Service Provision Control - The operational risk, i.e., the risk that the private partner would be financially penalised by an unsatisfactory service, has been controlled as this is a self-monitoring and benchmarked project. The **Self-performance Monitoring Criteria** assess the performance of the services provided against a benchmark that was negotiated within the contract with the MoD. This benchmark is still negotiable and it will be revised after one year in operation. The system is considered "fair" by both partners and is based on trust. The MoD has preferred to opt for this solution, according to the partnering approach adopted, instead of having a team on site to do the "contract monitoring". Usually this involves 12-16 people at a cost of at least £250,000/year, and that might not have a positive perspective to solve problems. The actual system involves penalty points for specific events, that if exceeded will induce a financial penalty. The information system interlinks this data on-line and the managers of the various departments have access to it.

The system consists mainly of a set of tables describing the events, for which a pre-determined number of points is attributed according to the occasion on which they take

place: Normal, Audit or Key Events (Very important days when key events take place, usually involving about 12 days a year). If the event takes place in a Normal day the points to attribute will be the pre-set benchmark, if the event takes place on an Audit day the benchmark is multiplied by two, and if it happens on a Key event day it will be multiplied by three since it very important that service should be flawless.

System of Points Deductible

	Points	Normal	Audit	Key Events	Benchmark
Description	#	X 1	X 2	X 3	## (pre-set)

Each manager has a standard template to fill in, and on a daily basis can control the number of points attributed and compare them with the benchmark. The system works on a 3-months basis, thus giving a good margin to correct problems.

4.2.9.2. Operation/Maintenance Costs

To facilitate staff employment Defence Management had to promote the transports and invest in the local bus network.

4.2.10. People Risks

Not emerged as an important issue

4.2.11. Force Majeure

Not emerged as an important issue

4.2.12. Residual Value

Not emerged as an important issue

4.3. ACCOUNTING ISSUES (PROCESS)

Not emerged as an important issue

5. Key Messages

Key Learning Points:

1- *Is PFI a sustainable model?* The main lesson to draw from the JSCSC case study is to demonstrate how a PFI project can be considered successful from the financial aspect but at the same time be particularly ruinous for one partner – The construction sub-contractor in this instance. For PFI to be a sustainable solution it must demonstrate being fair and a good deal to all stakeholders.

2- *Contracts must have good specifications (good quality of information is critical).* A good contract must be workable with good specifications. It must cover the technical deliverables and provide for an on-going continuous process that guarantees, over the long-term, good procedures during the contract management. In the JSCSC PFI contract the construction requirements were too loose.

For the Private Sector:

- There must exist a consistency in the strategies and objectives within the private sector team. It happened that from the concessionaire point of view the project was quite successful. Nevertheless, for the construction sub-contractor it was a nightmare. They lost a great deal of money, and the construction process itself was hectic.

- The project team must be strong for all partners. L.C. set up a team led by a too young and inexperienced project manager and also it was seriously understaffed. It took L.C. several months to realise that changes in the team had to be done in order to be able to fulfil the contract.

- Good Project Management is essential – The co-ordination between the various construction sub-contractors was a serious problem in part due to delays in design.

- Don't over reassure the other partner. For example, in order to reassure the MoD that the building was according to their wishes, L.C. devised design

procedures – Review Process – that proved to be hindrance leading to excessive delays, affecting the already tight construction schedule.

- The project was rushed due to delays mainly in signing the contract coupled with the need to open the College on a specific date (otherwise an academic year would be lost).

- Do not sign any contract without having all the planning permits in place. L.C. was surprised just after the signing of the contract with the demand by the planning department to lower the building by 2 metres.

- Do not sign a contract where there is too much room for interpretation. The brief from the Public sector was not clear enough; the construction requirements were loose and with open-ended solutions. As such, there was ample room for interpretation as to what the building was supposed to look like, consequently the key designer felt free to interpret the client's wishes.

- Naivete of L.C.. They tried to accommodate the requirements that were successfully imposed by the architect that wanted to build a flagship building, and that manoeuvred behind the scenes feeding to the MOD the requirements that they would in turn impose on L.C.. Due to the lack of previous specifications, and because both MOD and HLM would press so much, L.C. would finally concede.

- Lawyers can be useful. The team and project manager of L.C. was too much task-oriented and had an inborn aversion against lawyers, the perception being that they earn too much money for what they do. Consequently L.C. probably accepted some terms and conditions wrongfully imposed on them

- The private companies cannot take an over-optimistic approach taking risks for which they are not prepared.

- Value Delivery Network analysis. The co-ordination problems experienced by L.C. were originated in part by the huge number of sub-contractors involved. Now they are undertaking a major revamping of the company culture, to make the incorporation of their sub-contractors Value Chain Management systems into their own. Effectively, they are simultaneously working within the company developing their Value Chain analysis of the whole supply chain, and with their sub-contractors to make them aware of the advantages and helping them to set their own.

- Efficiency increases are always possible. To increase efficiency L.C. is trying to implement a Nation Wide Agreement on Procurement with several preferential designated sub-contractors.

- Unsuccessful projects hurt companies. In November 2000, John Laing plc announced the decision to sell Laing Construction plc and its subsidiaries. Negotiations took place between John Laing and O'Rourke plc and a Heads of Agreement was signed on 2nd April 2001.

For the Public Sector:

- A PFI project must be a good deal for all stakeholders. The public sector got a good deal, with the project on time and on budget, assuring the delivery of a service on a guaranteed benchmark. However this was at the expenses of heavy losses for the construction sub-contractor. This is not a sustainable solution, because if the private sector (where the construction companies are included) gets the perception that they stand to loose money, then PFI will no longer be a sustainable solution. There must exist a perception of fairness throughout the process.

- A good PFI contract must be workable and with good specifications, encompassing both the technical aspects and a good continuous review process. The main contract and the sub-contracts must form a coherent hierarchy.

- The PFI route, because its project and contract management is more controlled, when compared with the traditional methods of procurement, is more likely to ensure that the projects will be "on time" and "on budget"

Acknowledgements

The authors are grateful to all staff from Defence Management, John Laing Construction and Serco for their valuable contributions, opinions and assistance received in preparing this case study.

All opinions expressed in this case study are those of the authors alone.

ANNEX V

CASE STUDY

INDÁQUA FEIRA

PRIVATE FINANCE INITIATIVE (PFI)

CASE STUDY

INDÁQUA FEIRA

Stª Maria da Feira Water Supply and Wastewater Sewerage

Teresa de Lemos

Indáqua Feira

Stª Maria da Feira Water Supply and Wastewater Sewerage

Project Synopsis[1]

Title – Stª Maria da Feira Water Supply and Wastewater Sewerage.

Country – Portugal.

Project Cost – EUR 160 million (32 billion escudos).

Sector – Water Undertaking.

Status – Financial Close 3rd December 1999. Construction works started January 2000 with completion scheduled for 2008. Concession ends 2035.

Sponsors – Concessionaire/ Lead Manager - Indáqua Feira – Industria de Águas de Stª Maria da Feira.

Purchaser – Municipio de Stª Maria da Feira – Municipal Authority – Local Authority.

Financing Package - Total capital expenditure amounts to EUR 160 million.

The private sector, Indáqua Feira will raise a total of EUR 110 million: EUR 80 million of non-recourse finance from the European Investment Bank Loan (EIB) guaranteed by a Group of Portuguese Commercial Banks and EUR 30 million from sponsor equity and subordinated debt. The EIB loan offers a 25-year term and a grace period of up to 10 years before the repayment of principal commences.

The Municipality will contribute EUR 50 million.

Special Features – It's the first PFI type of project undertaken by a Municipality using European Union (EU) Cohesion Funds to leverage private finance for a major public infrastructure. These funds (85% non-returnable) would directly finance part of the capital works. The Municipality had not enough funds to undertake the project, and could not apply for a commercial loan because the service debt weight on the annual budget has a legally imposed limit of up to 20% of the budget.

Joint financing of the public and private sector was needed because with the level of investment needed it would be impossible to have an adequate return (the financial ratios of the model would not be favourable for the private loans) and simultaneously maintain a reasonable level of tariffs if only private funding would be used.

Brief – The PFI project was signed and Indáqua Feira was awarded the concession for water distribution and wastewater in Stª Maria da Feira. The Municipality commited itself to build part of the necessary infrastructure, for which it needed the contribution of the Cohesion Funds. However, in the meantime the political guidelines changed and the Municipalities were not allowed direct access to the funds. This has left the Stª Maria da Feira unable to fulfil its contractual obligations, and has led to a standstill in the construction of the sewerage networks.

[1] Presentation of Engº Paulo Jorge Ferreira de Sa for the Institute for International Research, Lisbon January 2000, and PriceWater HouseCoopers, News Releases (accessed 3 -8- 2000.)

1. BACKGROUND – HISTORY AND OBJECTIVES

1.1. WATER DISTRIBUTION AND WASTEWATER SEWERAGE MARKET IN PORTUGAL

1.1.1. Legal Framework

In Portugal, until the early 1990's,[2] the water distribution and wastewater sewerage systems were exclusive municipal prerogatives, with the sole exception of EPAL a state-owned company that supplied water to Lisbon and the surrounding municipalities. In November 1993, a new legal framework was set up and opened the water market to the private sector. The ultimate responsibility remains with the Local Authorities that have the power to award concessions to private companies to build and operate the systems.

The Government simultaneously created the Multi-municipal systems, concessionaire companies where the IEP-Águas de Portugal (IEP-AdP) – state holding company - always has the majority (>51%) of capital. The other shareholders are the interested municipalities and private companies that can never assume management responsibilities. The Multi-municipal systems may be privatised, in the future, up to 49%.

As of the beginning of 2001, the development of the Multi-municipal systems was mainly in the Central and Northern part of Portugal, a region with a high population density. In the southern part of the country, the municipalities are not willing to participate partially because of low population density means that the level of investment is very high in relation to the population served rendering very problematic the financial profitability of private investments.

The Government also created the Inter-Municipal Companies, formed by the Municipalities, where the IEP-AdP might not be a majority shareholder together with the private companies that might hold up to 49% of the shares (giving them management capacity and decision power). These can only be viable when the municipalities have financial capacity, and are more adequate for low investment infrastructures like the clean water distribution and wastewater collection networks.

[2] Melo-Franco 2000, 'The use and management of service contracts. National Report Portugal', *Water Supply* vol. 18, no.1 pp27, IWA Publisher.

Portugal has a population of 9.3 million inhabitants, and as of December 2000, the private sector (Inter-municipal or municipal systems) had 18 municipal water and sanitation systems under concession agreements serving a population of 945 000 people. There were also two other concessions under competitive bidding, corresponding to 160 000 people. There was also one collective wastewater treatment system serving 375 000 people and a bulk water system serving 250 000 people under concessions.

1.1.2. Water and Wastewater Market Data

The Portuguese water and wastewater sector is described in Table 1. As of 1999, the water distribution network was acceptable – over 90% of the households were covered. However, there were great deficiencies in the sewerage systems, for example, the connection to the wastewater treatment plants were available to only to 55% of the consumers. The values presented are national averages. Some regions have much worse indicators.

The Municipalities carry full responsibility for these systems, but the vast majority lacks the necessary funds to undertake the construction works. That is why the availability of EU Cohesion Funds, partially non-returnable, is critical to build the necessary infrastructures. It is also an urgent task as the deadline for the complete enforcement of the EU Water Framework Directive is 2010, when all the water distribution and sanitation system will have to be completed.

Table 1. The Water and Sewerage Sector in Portugal [3]

	1994 (*)	1999 (**)	2006 (***)
Household Water Distribution	84%	90%	95%
Connection to a sewerage system	63%	75%	90%
Connection to a wastewater treatment plant	21%	55%	90%

(*) First and (**) last year of the II QCA (Community Support Framework), EUR 1.7 billion.
(***) Last year of the III QCA, EUR 2 billion.

[3] Melo-Franco 2001, Portugal Case Study: Lusagua –The oldest Private Water Operator, paper present at the Southern European Water Summit, IBC Global Conferences Ltd, 13 March, Rome.

1.2. THE MUNICIPALITY OF STª MARIA DA FEIRA

Stª Maria da Feira[4] is a Northern Portuguese municipality located 30 Km from Porto and 270 Km from Lisbon, with 211 Km^2 of area, and a population of 130 000, which is expected to reach 170 000 in 2035 - end of the concession. Feira has great economic activity being the world largest centre of cork manufacturing, and other industries like shoe making, toys, wood products, paper, dairy products, etc.

Figure 1. Stª Maria da Feira Municipality

In 1999, the water supply network (main) had 280 km; and the wastewater network 180 km. Table 2 shows that the water system (distribution) was available to 30% of the population but with only 20% (10 750 registered consumers) connected.

The situation is even worse with the wastewater sewerage system, because the connection is done on a voluntary basis, involving the payment of a monthly fee. Although the wastewater sewerage system (and wastewater treatment) was available to 20% of the population, only 4% was connected. It was estimated that the real number should be around 6-7%, the difference being accounted by illegal connections (that are not registered and therefore don't pay the tax).

Both the water distribution and the wastewater market show a great potential for growth.[5]

4Stª Maria de Feira web site http://www.byweb.pt/santamariadafeira/index.html (accessed 12 September 2000).
5Indáqua Feira is going to try to assess the illegal wastewater connections: They are going to charge the wastewater tax together with all water bills and wait for the consumers protest stating that they don't have it.

Table 2. Water Supply and Wastewater Sewerage Systems

Stª Maria da Feira - 1999

	Available to Population (%)	Population (%) Effectively Connected
Water Supply & Distribution	30%	20%
Wastewater Sewerage	20%	4%

The main objectives of the concession are therefore:

- to provide the whole of the population with water supply and wastewater treatment;
- to improve the quality and safety of the service;
- to ensure that the level of tariffs is compatible with the population's standard of living;[6]
- to guarantee the adequate management capacity and skills for a project of this nature. The Local Authority lacks the necessary staff.

[6] Based on previous studies for social housing, it was estimated that over 95% of the households incomes was over 100 thousand escudos per month. A tariff of 400 escudos/m3, representing an expense of ~4.5 thousand escudos/month would be reasonable for this level of income.

2. THE BIDDING PROCESS

2.1. CHRONOLOGY OF KEY EVENTS

April 1997	The Municipality presented the application for the EU Cohesion Funds (II QCA) to the Environment Ministry in the amount 4.8 billion escudos to directly finance part of the capital woks. This amount was afterwards reduced to 3.5 billion escudos
27th September 1997	Competitive Tender was launched
17-20th March 1998	Bidding - Opening of the proposals
August 1998	The Ministry send the application to Brussels, but the II QCA (that would be finished end 1998) had already exhausted the funds
End 1998	Application for the III QCA, and the promise from the Environment Ministry that the application would be supported
20th November 1998	Proposals Preliminary Evaluation report
12th January 1999	Proposals Final Evaluation report
1st February 1999	Preferred Bidder: Indáqua Feira – Industrias de Águas de Stª Maria da Feira
February 1999 – June 1999	Discussion of concession contract with preferred bidder (the terms of the tender remain unchanged)
27th July 1999	Closing of negotiations
3rd December 1999	Signing of concession agreement
1st January 2000	Beginning of concession
2001	The Environment Ministry issued a law stating that all EU funds from the III QCA, would be channelled to the Instituto de Participações de Estado (IPE) and its companies that would build and manage all the wastewater sewerage systems in Portugal. This leaves the Municipality of Feira in a very delicate position, since it is bound to a contract to build several infrastructures for which it has not enough funds

2.2. PROJECT MANAGEMENT

2.2.1. Project Team

The Municipality had only one member actually negotiating the contract, the rest were consultants. The private partners presented a usual team of 5-6 members plus consultants.

2.3. NEGOTIATIONS

In September 1997, the competitive tender was launched and four consortia presented a proposal:

- **Indáqua Feira**, the shareholders were:
    - Indáqua - 68%;
    - Cifial - 25%;
    - Hidrocontrato - 5%;
    - Engil – 0.5% - Portuguese Construction Group;
    - Mota & Companhia – 0.5% - Portuguese Construction Group;
    - Soares da Costa – 0.5% - Portuguese Construction Group;
    - Teixeira Duarte – 0.5% - Portuguese Construction Group.
- **Feiráqua**, the shareholders were:
    - AGS – 36.5% (owned by Somague);
    - Aquapor – 36.5% (owned by IPE-AdP);
    - Efacec Ambiente - 12%;
    - IP Holding - 10%;
    - Camilo de Sousa Mota & Filhos - 5%.
- **Luságua**, the shareholders were:
    - Agbar - 49.98% – Spanish Water Services Group;
    - BPI - 30% – Portuguese Bank;
    - Edifer - 20% – Portuguese Construction Group;
    - Other - 0.02%.
- **Hidrofeira**, the shareholders were:
    - Construtora Abrantina - 30%;
    - Hidrodinâmica - 20%;
    - Focsa - 1%;
    - Seragua - 48%;
    - Urbaser - 1%.

The terms of the tender didn't require project finance structure for the concession. Only Indáqua Feira and Feiráqua presented their proposals according to this financing regime.

The proposals' five pre-defined evaluation criteria were weighted according the following percentages:

- Minimum Level of Tariffs - 70% (legally mandatory according to Dec-Lei 147/95 of the 21st June 1995);
- Financial structure and engagement compromise - 12%;

- Proposed Quality and safety levels - 8%;
- Start of service - 8%;
- Contribution to the Authority – 2%.

On the 1st of February 1999, Indáqua Feira was selected as the Preferred Bidder for direct negotiation with the Municipality. The concession contract was signed on the 3rd December 1999.

3. THE CONCESSION

3.1. MAIN PARTICIPANTS

3.1.1. Authority

Municipality - Câmara Municipal de Stª Maria da Feira

3.1.2. Contractors – SPV

The contractor Indáqua Feira is owned by:

- Indáqua - Industria e Gestão de Águas SA - 68%;
- Cifial - 25%;
- Hidrocontrato - 5%;
- Mota & Companhia, Soares da Costa, Teixeira Duarte Engenharia e Construções SA and Engil each hold 0.5%.

Indáqua and Hidrocontrato (participated by Severn Trent) expertise lies in the Operation / Management (O/M) of water and wastewater systems.

The shareholding structure is indicated in Figure 2. The figure also illustrates the relationships between the concessionaire – Indáqua Feira – the construction companies shareholders of the Construction sub-contractor and with Indáqua (parent company).

Indáqua's shareholders are

- Four Portuguese construction companies: Mota & Companhia, Soares da Costa, Teixeira Duarte Engenharia e Construções SA and Engil - each hold 14%;
- RAR Ambiente (Portuguese company) has a financial participation of 14%;
- Severn Trent Water International (STWI)[7] (a subsidiary of British Severn Trent Plc) a water and wastewater management company holds 30%.

Indáqua participates in three other water and wastewater concessions although not under the project finance regime: The municipalities of Fafe (since 1995), St°Tirso and Trofa.

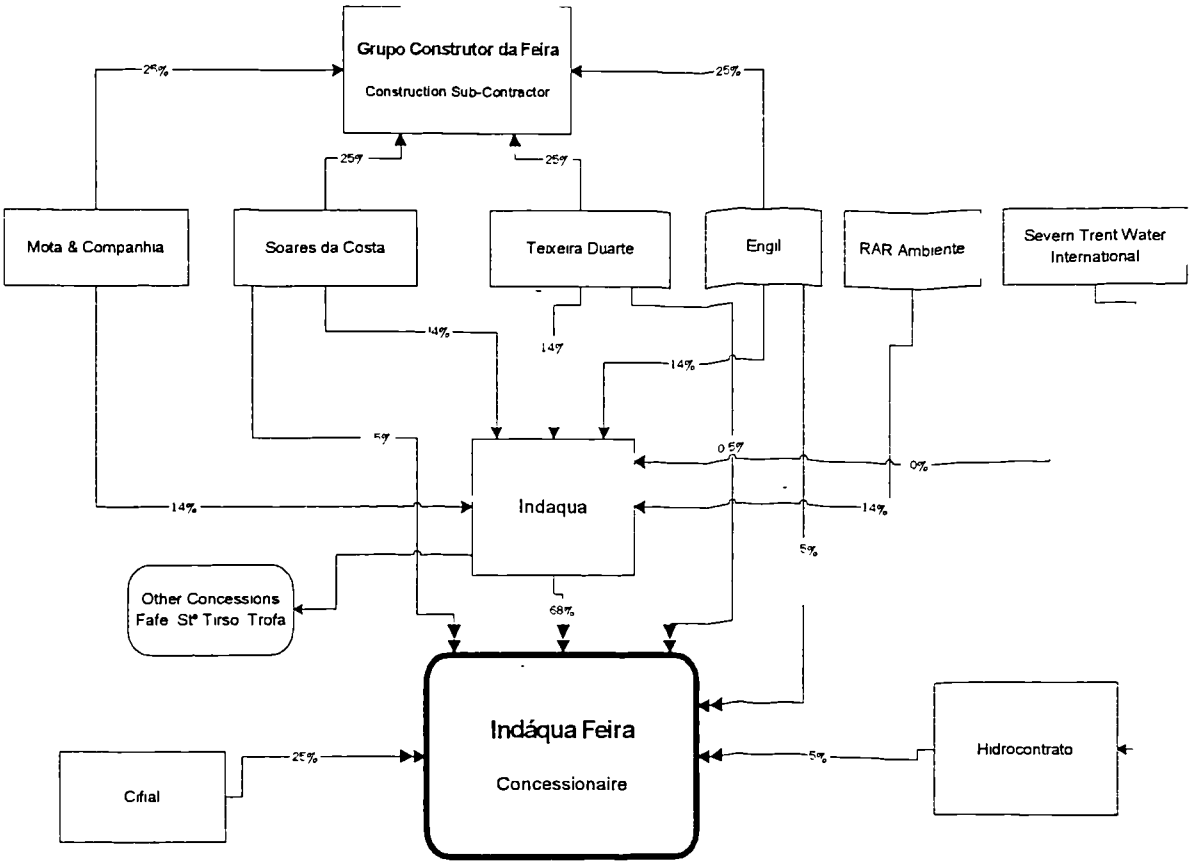


Figure 2. Indáqua Feira - Shareholders Relationships

[7] One of UK's leading environmentally engaged companies. As an international environmental solutions company, we are a leading provider of water, waste and utility services. (http://www.severn-trent.com, accessed 12 September 2000)

3.1.3. Construction Sub-Contractor

Grupo Construtor da Feira ACE, owned by the four construction companies that are Indáqua's and Indáqua Feira shareholders. The contractors comprising the ACE are jointly and severally liable for the execution of its obligations under the Construction sub-contract. If any one of the partners becomes insolvent, or withdraws from the ACE, the remaining partners will be responsible for assuming the remaining ownership and corresponding obligations.

3.1.4. Operating Sub - Contractor

The operation and maintenance is assured by Indáqua Feira.

3.1.5. Senior Lenders

- European Investment Bank (EIB) loan: EUR 80 million; 25-year term;
- EIB's financing is guaranteed by Banco Totta & Açores SA, Banco Totta & Sottomayor de Investimentos SA (formerly Chemical), and Banco Pinto & Sottomayor SA.

3.1.6. Consultants

To the Municipality:

- Economical & Financial - BES Investimentos;
- Legal - Gonçalves Pereira, Castelo Branco & Associados;
- The technical assistance was assured by the staff of theWater Municipal Services of Feira (SAMS).

To Indáqua Feira:

- Financial – PriceWaterHouse;
- Auditors & Project Engineering - Consortium COBA/EFIEFE;
- Legal - PLMJ - Saraga Leal, Miguel Judice;
- Project – CLSER.

3.2. CONTRACTS

3.2.1. Concession Contract

On the 3rd December 1999, Stª Maria da Feira Municipality granted to Indáqua Feira two concession contracts for 35 years: first the water collection and distribution and second the wastewater sewerage treatment. Indáqua Feira will design and build part of the network of water supply and treatment, and operate the whole system.

Under the terms of the concession, the municipality has to give Indáqua Feira an annual subsidy of 250 million escudos in cash or equivalent in construction works, for a period of 7 years, totalling 1.75 billion escudos. The choice is the exclusive prerogative of the municipality and it has to be communicated to the concessionaire in advance from the planned construction schedule (from 2 years to 6 months depending on the type of construction involved as to allow the necessary time to adjust the concessionaire's plans). The construction works have to be done according to the terms defined in the concession contract.

The Municipality is also committed to build part of the infrastructures: the ETAR's (wastewater treatment plants), the reservoirs, the pumping stations and the sewage interceptors, i.e., 30% of the water distribution and wastewater sewerage networks.

Construction of the water system started January 2000, and construction of the two complete networks was scheduled to last for 8 years and 3 months.

3.2.2. Design and Construction Sub-Contract

The design and construction contract was awarded to Grupo Construtor da Feira, ACE, constituted by the construction companies shareholders of Indáqua Feira: Mota & Companhia, Soares da Costa, Teixeira Duarte Engenharia e Construções and Engil.

The concessionaire's construction works involve:

- Water and Sewage Mains (2 x 1 100 Km)
  - Water Distribution 8 billion escudos
  - Wastewater Sewerage 11 billion escudos
- Water Pumping Stations - 2 units (< 200 m^3/h) 100 million escudos

The municipality is committed to build

- Sewage Interceptors (100 Km) 4 billion escudos
- Reservoirs - 18 units (16 000 m^3) 800 million escudos
- ETAR's 3 units (20 000 to 85 000 inhabitants)
  5 units (5 000 to 20 000 inhabitants)
  12 units (<1 000 inhabitants) 3.2 billion escudos

3.2.3. Financing Agreement – Loan agreement

Total capital expenditure amounts to EUR 160 million. The financing has the following sources:

- *The private sector, Indáqua Feira raised EUR 110 million*:
  - Sponsor equity and subordinated debt: EUR 30 million;
  - EIB Bank Loan in non-recourse financing regime: EUR 80 million. Guaranteed by three Portuguese commercial banks: Banco Totta & Açores SA, Banco Totta & Sottomayor de Investimentos SA (former Chemical), and Banco Pinto &

Sottomayor SA; 25-year term and a grace period of up to 10 years.

Very importantly, the availability of EIB' financing to the private partner is conditional upon the completion of the construction works which are the Municipality's responsibility.

- *The public sector, St*ª*Maria da Feira Municipality, contributes with EUR 50 million* (8.1 billion escudos worth of construction works and a subsidy of 1.75 billion escudos). The origin of the funds is:
  - European Union Cohesion Fund: 3.5 billion escudos (the first projections were that the fund – non returnable - would cover 85% of the investment, but due to the constraints of the III QCA this percentage is now reduced to an estimate of 50%);
  - Municipality own funds: 2 billion escudos. They have a budget of around 8 billion escudos, the current expenses are about 4 billion escudos. Need 2 billion escudos for other internal investments, and only the remainder can be used to invest;
  - Commercial Loans: 2 billion escudos;
  - A contribution to the concessionaire of 1.75 billion escudos cash or equivalent in construction works for a period of 7 years (250 million escudos per year).

The municipality has opted not to pay cash as the contribution to the concessionaire and instead undertake construction works. They consider that the works commissioned directly by the municipality can be cheaper than when done by the companies sub-contracted by the concessionaire to construct the networks. One of the reasons is that in Stª Maria da Feira the unemployment rate is about 2.8%, which in practice is full employment. This means that the non-local construction have to pay premium wages, increasing their costs and putting them in disadvantage with the local companies. There is also a socio-economic reason: the municipality has had very good long-term relationships with local contractors. In practice, this means that when the market for construction is good the companies don't overcharge, and vice-versa that when the market suffers a downturn the municipality proposes fair prices, taking no advantage of the situation.

3.2.4. Operation and Maintenance Sub-contract

Not available

3.2.5. Direct Agreement

Not available

3.2.6. Shareholders Agreement

Not available

3.2.7. Dispute Resolution Procedure

Not available

3.3. LIFE CYCLE

The Life Cycle of Indáqua Feira Life Cycle (Figure 3) started with the establishment of Business Need for the construction and maintenance of the water distribution and sewerage networks in the Municipality of Stª Maria da Feira – Northern Portugal.

The next steps involved the appraisal of the financing options, and as the Municipality has little funds it was decided to apply for the non-reimbursable EU Cohesion Funds. The volume of construction works to undertake was such that other sources of financing were necessary. Taking this into account a competitive tender was launched, and two proposals came forward with a project finance structure.

Indáqua Feira was appointed as Preferred Bidder and the concession contract was signed on 3rd December 1999.

The construction works was divided between the concessionaire and the Municipality. The operation of both systems was Indáqua Feira's immediate responsibility. Problems with the access to EU funding caused delays to the Municipality's share of construction works, that as of May 2001 were not yet fully solved. The concession will end 2035.

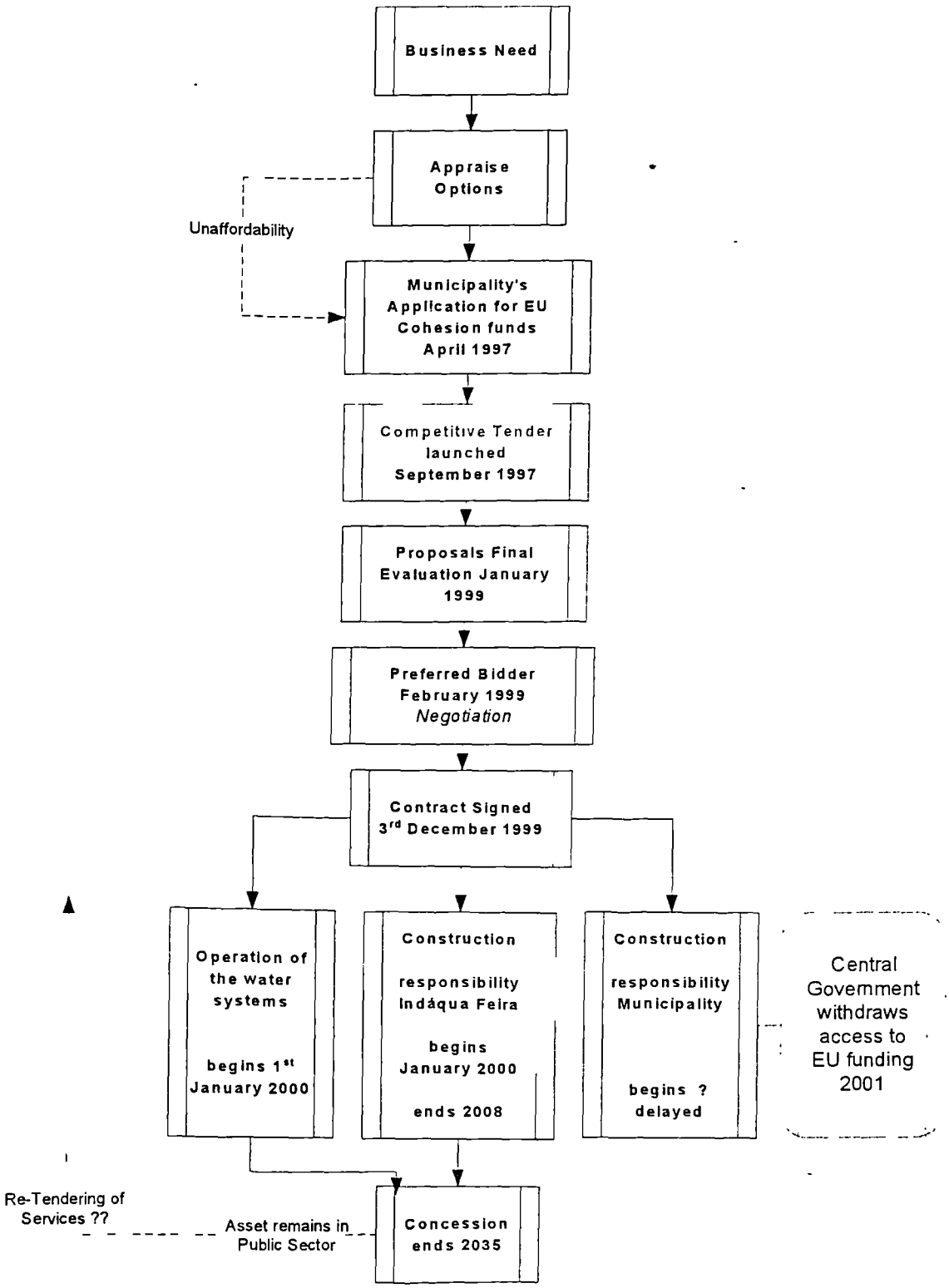


Figure 3. Indáqua Feira Life Cycle

4. RISK TRANSFER

4.1. VALUE FOR MONEY (VFM) AND PUBLIC SECTOR COMPARATOR (PSC)

No analysis whatsoever. However, the scheme would not be possible utilising any other procurement and financing arrangement.

4.2. RISK ALLOCATION

A summary of the main risk categories allocation matrix is described in Table 3. There is a brief description of the risks and the respective allocation agreed between the public and private partners. It is interesting to note that for some risks the consumers carry the risk. There follows a discussion of the main issues raised within the various risk categories.

4.2.1. Political and Regulatory Risks

Non-availability of EU funds after signing the concession contract – Stª Maria da Feira Municipality opted to apply for EU funding to construct some infrastructures because it has a small budget and is legally prevented from having the service debt weight over 20% of its budget. The concession contract was signed in the belief that the Environment Ministry would make the necessary funds available. What happened was that: First, the Central Government took about a year and a half to send the application to Brussels for funding through the II QCA. It arrived there four months before the end of the program and the fund was exhausted. Second, by the time the III QCA was available the Minister had been replaced and the policy for EU funding too, giving in practice sole access of EU funds to IEP-AdP.

Table 3. Stª Maria da Feira Municipality Risk Matrix

Global Risk	Main Characteristics	Project Specific Risk	Description	Allocation	Comments
Bidding	Correct Information	Correct specifications		Concessionaire	
Commercial	Demand Risk Price Variations Payment Risk	Adhesion level to sewage system	Lo of income due to non-usage of service	Concessionaire	The sewage connection is not mandatory
		Lower than expected population	Loss of income	Municipality Consumers	The Municipality is responsible for the demographic studies The tariff will then be raised
		Billing risk	Lo of income due to non-collected bill	Concessionaire	Under 10% of the estimated consumption it's an automatic mechanism for renegotiation of the financial equilibrium
		Lower than expected water per capita consumption	Its i assumed a pre-defined amount for increase in water per capita consumption	Consumers	The lower revenue will be reflected in the price that the public pays
		Price variation of the water supplied by A.D P		Consumer	
		Lower revenue due to fewer industrial sewerage connection		Concessionaire	The concessionaire is responsible for the industrials forecasts estimates
		Unilateral tariff revision	Loss of income	Municipality	When the Municipality unilaterally adversely changes the tariffs a Termination Event is initiated. The Municipality will assume all the concessionaire's obligations, including debt repayments
Construction	Cost Overruns Completion Delays Latent Defects In time To budget To specification Archaeological findings Ground conditions Site availability	Delays in expropriations	Construction delays due to unavailability of land	Municipality Concessionaire	The contractor is responsible for initiating all steps necessary for the expropriation The Municipality is responsible for the payment of any indemnities
		Contractor Solvency		Construction subcontractors	If any of the partners of the construction consortium becomes insolvent, the remainder will have to carry out the obligations of the construction sub-contract
		Cost Overrun		Constructor	The Construction contract is fixed price
		Costs and delays caused by change in contract		Consumers	
		Unforeseen ground condition		Construction sub-contractor	
		Permits and approvals	Delays in works	Contractor	The ACE will negotiate independently with the Municipality
		Co t overrun in expropriating		Shared	The concessionaire will pay immediately the pre-defined amounts and the municipality supp rts the excess
		Completion Delays		Concessionaire	Turnkey contract The risk transferred to the design / builder – Construction contractors shareholders
		Damages to third party	Liabilitie to third partie	Concessionaire, Constructors	Transferred to insurance companies, including civil responsibility
		Damages to own work	Accidents	Concessionaire	Transferred to the insurance companies, up to a commercially accepted level
		Latent defects in the infrastructures built by the municipality		Shared Municipality and concessionaire after auditing and approval	The municipality transfers the risk to the constructors after the concessionaire approval
		Delays in the w rks assured by the municipality		Municipality	It is assumed that it can alter the financial equilibrium
		Local strikes		Contractor	The strikes have the potential for causing delays and or cost overruns
		Archaeological findings		Municipality	The contractor must be unable (or delayed) in carrying out works and/or increased costs
Design	Compliance with service performance	Design risk	Delays and cost overruns originated fr m errors and omissions in design	Concessionaire	Transferred to the design builder up to 5 years. To the concessionaire thereafter
Economical & Financial	Inflation Interest Rate Foreign Currency Exchange Rate Insolvency of Consortium Availability of Foreign Currency Payement	Inflation	Increa e in costs	Consumers	The tariffs will be indexed to inflation
		Interest Rates	Increase in financing costs	Concessionaire	
		Adverse tax or accounting change	Lower cash flow or lower profits	Concessionaire	The banks also carry some risks
		Shareholders insolvency	Equity contributions not made	Shareholders Banks	The shareholders are required to guarantee their equity commitments
Force Majeure*	Wars Natural Disasters	In general events that lead to the inability to generate revenues		Municipality	The concessionaire will be entitled either to restoration of financial losses or termination of the concession with an adequate compensation
		General Strike		Municipality	Are considered Force Majeure events
Human	Culture Ethics Values Beliefs Risk Profiles				
Legal	Breakdown Consortium Insolvency				
Operation & Maintenance	Operation and Maintenance Costs Obsolescence of Technology and Service Performance Latent Defects	Operating Costs higher than anticipated		Concessionaire	
		Higher than anticipated sewerage operating costs		Shared by Municipality and Consumers	The concessionaire will be required to operate sewerage plants that the Municipality has yet to construct. If the O/M costs turn out to be higher than anticipated either the tariffs can be adjusted or the Municipality must make a compensation payment
		Performance Level		Concessionaire	
		Raw water supply by A.D P insufficient or interrupted		Shared by Concessionaire, Municipality in the case of Force Majeure, and A.D P when it's their fault	If insufficient water is delivered a compensation penalty payment is made to the concessionaire by A.D P based on time, unit price and the minimum level of supply mechanism. In the event of Force Majeure there is no payment, a re-negotiation of the contract required
		Raw water costs		Consumers	The increase in price is passed directly to the consumers
Political & Regulatory	Will of Government Environmental Concerns Regulatory Agencies Price Controls Change in Law Labour Regulations Ultra Vires	Licences & authorisations	Construction delays caused by non existence of licences	Concessionaire	
		Less or no EU funding for the municipality		Municipality	Can lead to renegotiation of the financial equilibrium, since it affects the concessionaire's income due to non-availability of infrastructures
Residual Value	Asset Value				Assets to be returned to Municipality at zero cost
Social	Protestor Actions Environmental Groups Associations				

According to the concession contract, any delays in construction or no (reduced) EU funding are considered to be the municipality' exclusive responsibility, as it is recognised that Indáqua Feira would incur revenue losses due to the non-availability of infrastructures that are part of the networks under construction and that are critical for the whole operation. A possible solution for Stª Maria da Feira would be, for example, to allocate construction to the private partner, but this would imply a renegotiation of the contract and it will necessarily be reflected in raising the tariffs. Stª Maria da Feira Municipality partially solved the problem by establishing a second contract to build their share of water distribution system with SIMRIA - Sistema Multi-municipal de Recolha, Tratamento e Rejeição de Efluentes da Ria de Aveiro, a local Multi-municipal system participated by IEP-AdP and adjoining Municipalities.

However, Stª Maria da Feira has yet to solve the problem of funding to construct its share of the wastewater sewerage network the ETAR's and sewage interceptors. The share of the network that is the private partner' responsibility is also on hold, as under the agreement established between Indáqua Feira and EIB, the concessionaire will not start any investments in the sewerage network until this issue is definitely solved.

State Monopoly - In Portugal, Local Authorities are usually very small, and depend on the availability of EU structural funds to undertake the much needed infrastructure investments. But, the Central Government controls the III QCA funds, and only accepts the proposals (against EU directives) from Multi-municipal systems in which IEP-AdP is a majority shareholder. Nor can the private companies or even the Local Authorities apply, as was the case when the Indáqua Feira concession contract was negotiated and signed.

Consequently, the private companies, like Indáqua, that have entered the water supply and sewerage management market with an expectation for a large market are now faced with legislation that, in practice, gives the monopoly of all the systems upstream from the clean water distribution networks or downstream from the wastewater collection networks to IEP-AdP a state owned company. IEP-AdP have the exclusive rights to apply for the EU funding (non returnable) and the Local Authorities, that have the exclusive competence to manage these services, don't have the necessary funds to undertake the construction works. This leaves for the private sector only the market for infrastructure of the clean water distribution and the wastewater collection networks, because with the level of investment needed it would be impossible to have an adequate

return and simultaneously maintain a reasonable level of tariffs if only private funding would be used.

The power that IEP-AdP has derived from the access to EU funding extends to other areas like the above mentioned clean water distribution and the wastewater collection networks, because in any case the municipalities don't have funds to build them. Also, when there are tenders the IEP-AdP, through a subsidiary – Aquapor, is present, competing with the other private companies with the advantage that being a government organisation it can trade favours with the municipalities promising them other infrastructures, schools, etc.

As an example of the prevailing political will, on 25th May 2001 the concession of the Municipal System of Wastewater Treatment from [8] Algarve(southern part of Portugal) was awarded directly without any tender to the company Águas do Algarve, owned 51% by IEP-AdP and several municipalities of Algarve that were forced to join against their will.

Melo-Franco [3] described the current situation:

> *In Portugal, the outstanding contribution from the EU funds, has contributed to*
> - *A significant reinforcement of the role of the state held corporate sector;*
> - *A private economic players role much below their expectations.*

Conflicting interests - The disarticulation among Ministries is also a very significant issue when dealing with 'project finance' type of projects, as it leads to delays in the decisions and can reduce the bargaining power of the public sector in a negotiation. The negotiation teams are almost always replaced when the government change, each Ministry has its own policy guidelines and the Government often imposes politically driven decisions that affect the financial equilibrium of the project.

There are also discrepancies and a possible conflict of interests with the regulatory authority. The Instituto Regulador de Águas e Residuos (IRAR) – Regulatory Institute of Waters and Residues - is nominated by the Environment Ministry and regulates this activity within the concessions of municipal and multi-municipal systems, but doesn't regulate the Local Authorities if they themselves manage the water and wastewater systems. One of the IRAR' tasks is to undertake a pre-feasibility analysis to all tenders for concessions for water, wastewater and solid urban residues systems.

[8] Sistema Municipal de Saneamento Básico do Algarve

Inflation - Both Indáqua Feira and the Municipality carry financial risks, because both have construction works to undertake, and need external funding. Inflation is a major risk that the project carries especially because the works are going to extend for eight years.

Payments by the Municipality - The concession can involve several types of payments to the concessionaire from the Municipality. These can be either the predictable annual subsidies to the concessionaire or unexpected payments like when the financial equilibrium of the concession has to be re-established by the Local Authority. There are two basic issues regarding the realistic possibility of getting the payments:

- The Local Authorities have small budgets and the service debt weight on the annual budget is nearly always very close to the limits, so they cannot recur to further borrowing. Any financial compensation will be hard to get;
- The other way to get a financial compensation is increasing the tariffs, which is both unpopular and politically damaging to the local politicians.

4.2.3. Social Risks

Public Perception - This project doesn't involve a great deal of controversy since the need for the establishment of the water distribution and sewage networks is well understood and accepted. Nevertheless it is always necessary to mitigate some opposition especially related with the inconveniences during the construction stage. For example, it is necessary to maintain good relations with the church (it is a strongly catholic region) and make provisions to prevent construction works, like open ditches, disrupting the passage of processions.

Mixing Local Authorities - The solution to integrate Stª Maria da Feira network with the networks of adjoining municipalities carries the risk of opposition based on ancient rivalries. The projects involving water supply are especially sensitive to these issues and procedures to deal with them have to be established.

Rights of Way - During construction it is also necessary to take care that the rights of way are accounted for. Local people are very sensitive to these rights.

4.2.4. Environmental Risk

Environmental Impact Assessment studies are needed only for the ETAR's construction, but as their dimension is relatively small the environmental impact usually doesn't represent a big risk.

4.2.5. Legal Risks

There is a contradiction on the competences within the several governmental bodies involved in the contract. On one hand, only the Local Authorities have the legal endorsement to sign a contract, but on the other hand it is the Central Government that has the legislative power and controls the allocation of EU funds.

4.2.6. Bidding Risks

Both the public and private partners fully assumed their respective bidding costs. These are high and at a total loss to the private partner if they don't win the bid.

Partnership Approach to the Negotiations - The complexity of this concession contract has lead to extensive negotiations and special care was given to establish a good relation between the authority and the concessionaire. This approach has helped to solve many of the problems encountered.

Experience - The experience of how to deal with these processes is very important, as cost reductions can be huge. For the public partner this was the first project undertaken using project financing and the costs for the municipality went up to 500 million escudos. They estimate that the experience and knowledge gained with the negotiation of this contract makes it possible that on future negotiations the costs will be reduced to about 200 million escudos.

Information Quality - The bidding risk is related to lack of and erroneous information that can lead to the inability to take decisions, or alternatively to make the wrong ones. After the signing of the contract, it became clear that clarifications, interpretations, etc., were still needed. Clearly a sign that the information provided during the negotiations was not completely adequate.

4.2.7. Construction Risks

Construction risks are those risks that have the potential for causing Completion Delays, Cost Overruns and Latent Defects. The construction of the entire water distribution and wastewater sewerage treatment systems is split between Indáqua Feira and the Municipality, which is responsible for building the sewage interceptors, the reservoirs, the pumping stations and the water treatment plants. Both the Municipality and the concessionaire carry construction risks.

Non-Completion or Completion Delays - The Municipality took the risk of completion delays for the infrastructures that it is supposed to build. These are part of a network and its non-availability will necessarily affect the concessionaire financial equilibrium because if it is impossible to connect the consumers Indáqua Feira will have no revenues. As of May 2001, the Municipality' construction works were behind schedule due to lack of funds. In order to minimise the effects to the overall plan, the concessionaire has already postponed the works in the wastewater sewerage of year one, and merged the activities of year-one into year-two

One of the rules established between Indáqua Feira and EIB is that they will not start construction of the sewerage network and the Bank will not make available any funds for this purpose unless the issue of the Local Authority delays in the investment (ETAR's and interceptors) is definitely settled. This type of risk can be eliminated if the private partner is fully in charge of all construction works, but this would necessarily lead to raising the tariffs.

Expropriations, Site-Availability - The very small property dimension in this region make site availability a very important issue. The Municipality took the risk of delays in site availability due to delays in expropriations, and the risk of expropriations' cost overruns. The concessionaire supports the cost only up to a predefined level. Expropriations are mainly needed for the construction of ETAR's and water pumping stations. For the rest of the networks it is only necessary to safeguard the rights of way.

The risk of social outcries related to expropriations is greater during the construction stage. Due to the very small property dimension, the number of expropriation processes can seem large relative to the area involved (213 Km^2).

Cost Overruns - The concessionaire took full construction risk associated with the part of the network allocated to them. Indáqua Feira then partially transferred this risk to the construction sub-contractor – Grupo Construtor da Feira – that signed a fixed price contract subject to inflation correction and insurance coverage of cost overruns and completion delays. The risks associated with delays in obtaining licences and authorisations are with the concessionaire.

The construction risk is especially sensitive to price variations, since the Investment Plan spans eight years, which makes the uncertainty attached to the construction budget relatively high.

Latent Defects - The Municipality transferred their latent defects risk to the concessionaire conditional to Indáqua's project approval and auditing of the construction works undertaken by the concessionaire. The great majority of the mains to be installed are standard – 90% of the network has pipes with the same diameter – 90 mm for the water pipes, and 200 mm for the wastewater sewerage - and this greatly minimizes risks.

Ground conditions – There is a significant risk related to ground conditions during the construction stage. Cables belonging to other companies like the telephone and power companies also occupy the area where the water and sewage pipes are to be installed. Traditionally the discipline of the several companies that utilise the underground for their networks is poor. For example, there are big problems knowing the exact location of power cables.

4.2.8. Design Risks

Quality of information - The Concession Contract integrates a detailed investment plan of the network but the great design risk is related with the specifications that have proved not to have the necessary detail. This has led to the need for countless interpretations and clarifications with consequences at the construction level.

4.2.9. Commercial Risks

The commercial risk depends on the revenues from the services provided. The revenue level is affected by the following four main factors:

- Adoption level (before construction 20% for water, and 4% for the wastewater sewerage);
- Demographic evolution of the municipality;
- Water per capita consumption;
- Payment risk.

The commercial risk allocation is split among the municipality, the concessionaire, and the consumers. If the concessionaire is under certain adverse conditions the consumers carry the risk through increased tariffs. It is important to note that the consumers are not homogeneous. There are three segments: domestic, commercial and industrial. Each one has different needs and their future evolution differs too.

Adoption level – This is the most important risk assumed by the concessionaire. It is expected that the majority of new consumers will connect to the service during the construction stage. It is very expensive and inefficient to make the connection to a consumer after concluding the installation of the main pipes.

Marketing campaigns are scheduled to promote the connection particularly to the wastewater sewerage network. The connection to the wastewater sewerage is critical, because it is not legally mandatory and is generally considered to be the most profitable segment of the business. Its need is still not very well understood by all consumers, as they are used to discharging (at no cost) the wastewaters without treatment and now they would have to pay for that service.

Demographic evolution – The demographic studies are the municipality' responsibility: if the population evolution proves to be 10% less than the forecast, there will take place an automatic mechanism for the renegotiation of the financial equilibrium of the concessionaire and the tariffs will be raised. It is considered that for the demographic evolution very conservative estimates were used hence this risk is small.

Per Capita Consumption - If per capita consumption is 10% less than of the forecast, tariffs will be raised.

Payment Risk - Historically, the payment risk (billing risk) is low, because it is an essential service and in the case of non-payment it will be discontinued. The weight of the water bill in the overall budget of the consumers is reduced and an upward margin of 20% would be acceptable. This explains why the other concessions have already

increased prices without any problem (initially they were supposed to lower the prices), adjusting the prices to the operational costs. For example, Águas do Cávado was planning to reduce the price and instead raised it from 50 to 65 escudos/m^3.

4.2.10. Operation/Maintenance risks

The O/M risks are mainly related with raw water supply and the O/M costs. Both issues are discussed below.

4.2.10.1. Raw Water Availability

The water has to be supplied by another company – Águas do Douro e Paiva (A.D.P.) - and there is always the risk of an interruption or insufficient supply. The Concessionaire and the Municipality in the case of a Force Majeure event share this risk; otherwise A.D.P. carries the risk and correspondent liability.

4.2.10.2. Operation/Maintenance costs

The technology used is rather conservative and the risks associated with O/M are generally well known and mainly related with the ageing of materials. Severn Trent has given technical assistance at the beginning of the project, but now they consider it to be unnecessary and expensive, viewing their participation in the project as merely financial.

To guarantee an adequate level of service and to overcome the problems that will arise it is expected that Indáqua Feira's staff will increase and that they will have better and more technologically advanced means.

One of the main items in O/M costs are the wages. Indáqua Feira staff are highly qualified. It happens that in the private sector the less qualified levels (administrative clerks) earn less than in the public sector. The reverse happens for the highest levels, where in the private sector they earn much more than in public sector.[9] The salary range in the private sector is much wider, than in the public sector where it is around 1

[9] An engineer with 32-35 years earns less than 200 million escudos/month.

to 4. It looked like that as the costs with personnel are higher in the private sector apparently this would put Indáqua Feira at a disadvantage. It happens, private employees are more motivated, and are more efficient a counterweight to higher costs.

It is important to note that with the contractual requirement to absorb former municipality employees, the concessionaire has to take risks that otherwise could be transferred to a third party, like an O/M contractor.

4.2.11. People Risks

By law, in all concessions, the Municipality's employees have the option whether or not to be transferred to the concessionaire, with their previous rights and privileges always guaranteed. Indáqua Feira absorbed 30 employees that had to be trained and integrated into the culture of a private company. It is important to move them away from their old working environment, and give them better working conditions, like good changing rooms, etc. In this northern region, the unions are notorious for standing for their rights.

4.2.12. Force Majeure

Due to the relatively large area of the network (213 Km^2) it is unlikely that Force Majeure events will affect the whole network, even in the worst scenario. Most likely, the events might result in the non-functioning of some items in low areas more susceptible to flooding.

A Force Majeure event can lead either to restoration of the financial equilibrium of the concessionaire or termination of the concession with an adequate compensation.

4.2.13. Residual Value

The assets have to be returned to the public partner at no cost and in good working conditions. The technology and the behaviour of the materials used are well known, so this risk should not be very significant. However due to the long concession period there is always the possibility of unexpected deteriorations.

4.3. ACCOUNTING ISSUES (PROCESS)

Specific to Local Authorities

5. KEY MESSAGES

Key Learning Points:

1. **The Political/Regulatory Risks can never be underestimated** - This case study illustrates that not even the public partner is free from political/regulatory risks originated by their own government. Usually the private partners are more subject to the adverse consequences and uncertainties related with the political/regulatory risks. As with what happened with Indáqua Feira demonstrates every partner can be affected.

2. **Decision Power, Lack of Empowerment** - Stª Maria da Feira Municipality suffered the consequences of incongruence in the governmental system. On one hand only Local Authorities had the power to award the concession, but on the other hand they could not minimally control the decision power that derived from central government directives. An important lesson to draw is not to sign contracts for which they don't have to rely on future decision, as it was the case where there was no firm (written) commitment from the Central government to allow the Municipality access to EU funding.

3. **A partnering approach is beneficial** - In this project there was a partnering approach to project management, the development of a sense of trust, and the understanding of the need to work for a common goal both from the public and private partner – that was essential to overcome some difficulties, and is still prevalent in the present.

4. **Small Dimension projects and/or sponsors can be developed using the PFI model (with project finance methodology) subject to certain conditions:**

   - **Too Small Project** - From the point of view of a private company interested in investing in this market, a too small project dimension can be solved establishing a pool of projects with different Municipalities. That is, the financing package is one for all projects (conjoint), but the individual projects are dealt with the different municipalities involved. However, this solution (currently being tried) creates additional problems:

     1. There is the need to manage different partners in the different municipalities;

2. There are different municipalities to deal with, and not all of their interests are coincidental;

3. Finally, there are still some legal problems to solve.

- **Too Small Sponsor** - Stª Maria da Feira is ranked about the 20th Municipality (or between the 10th and 20th)[10] in dimension in a universe of three hundred twenty five in Portugal. Even so, it is considered too small to undertake a project like the one described in this case study. The issue is not even one of financial capacity, but one of management ability and skills. It is essential for the success of PFI projects that the Municipalities that currently are seriously understafled can constitute stable and (relatively) autonomous teams to manage these projects. The same reasoning applies to small medium enterprises (SME).

For the Private Sector:

- **Sharing construction responsibilities is a destabilizing factor** to a project finance type of project.
- **There is still very little experience in long-term relationships** - To find capital to construct the systems is relatively easy (BEI, commercial banks, etc.), what has proved to be more problematic is the operation/maintenance stage that created the awareness for the need of good contract management procedures.

For the Public Sector:

- **In Portugal, there is no tradition to learn from past cases**. - Whenever a past experience is used, it is only to copy without critical analysis. This can lead to disastrous results as in Tavira where they copied a contract. After bidding started the tender had to be suspended, because the contestants started asking for clarifications that could not be adequately answered. Finally it was cancelled.
- **Clear objectives are critical** - The Public partner has to have a clear idea of the objectives, before issuing the tender. Apparently clear objectives were not defined. This has over-extended the negotiation period.

[10] Project finance with the local authorities the coastal region of Portugal seems to be feasible, but in the interior the management, the organization and the procedures are difficult to overcome due to the very small dimension.

- **Don't under-staff the negotiation teams** - The Public negotiation team was in clear numeric disadvantage.
- **Dangers of an excessive emphasis on the price in the selection criteria** - This weight is legally predefined in Dec-Lei 147/95 21 June and all the concessions' tenders for water and wastewater must abide by it and give 70% weight to the price criteria, consequently the selection is very dependent on the price. For example, in the case of Indáqua Feira there was one proposal that presented such a low tariff that would win the tender leaving aside the technical aspects in which the proposal was very deficient. It took three quarters of the time of the evaluation committee to study the technical details and justify that it could not attain the necessary levels of service. Otherwise, the tender would be won by a technically very weak proposal and consequently the service provided would not be adequate.
- **Even for the public sector the rules for the usage of the structural funds are changing** - In the II QCA the non-returnable fraction was 85%, now with the III QCA is between 40-50%, thus increasing the need for regular public funds.

Acknowledgements

The authors are grateful to all staff from Indáqua, Indáqua Feira, Santa Maria da Feira Municipality and Luságua for their valuable contributions, opinions and assistance received in preparing this case study.

All opinions expressed in this case study are those of the authors alone.

ANNEX VI

THE ADJUSTMENT OF PFI PROJECTS AND SMES

The adjustment of PFI projects and Small and Medium Enterprises

1. INTRODUCTION

Since 1992, when the UK government introduced PFI, the market for PFI projects (or PFI type) across Europe has steadily increased, the main interest for the governments being the capture of private funding for governmental projects. It is clear too that governments constrained by the demands of the Maastricht Treaty, have severe budget constraints and will pursue the PFI route to undertake its projects[1]. As expected, large construction companies that have greater financial capacity to raise funds than small companies are the major private players. As the PFI market develops large companies form consortia to bid (very often cross-border) for large infrastructure projects launched by governments. In Portugal simultaneously with the introduction of PFI there occurred the opening to the private sector of several areas of economic activity, like water, sanitation and transport, which require the construction of large infrastructures. The current scenario is therefore of an unavoidably expanding PFI market dominated by large companies, because governments need private funds and large companies are in a privileged position to obtain this financing and on top get the extra benefit of diversifying their activities and countering and smoothing the construction industry's economic activity cycles.

Some concerns have been raised that Small and Medium Enterprises (SME)[2] are being left out of the PFI market due to the dominance of large companies. As an example, in Germany the Ministry of Finance of the State of Rheinland-Pfalz[3] presented the endangering of SMEs as a contra-argument to the utilisation of PFI as a procurement tool due to the conflict between the application of the value for money concept and measures for SME protection. This is a key issue with a great socio-economic impact, as the construction sector throughout Europe always plays a very important economic role in the national economies in terms of business volume and employment, and SMEs constitute a large segment of the construction sector.

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[1] For an introduction on PFI and its background see: Lemos, M.T.; Betts, M.; Eaton, D. and Almeida, L.T., From Concessions to Project Finance and the Private Finance Initiative, PPP/PFI, *Journal of Project Finance*, Fall 2000.

[2] According to the European Commission SMEs are all private enterprises with: Less than 250 employees: Turnover =< 40 Million Euros, or Balance Sheet =< 27 Million Euros; and pass the Independence criteria: >=25% of equity cannot be owned by any company that cannot be qualified as a SME (except investment or venture capital companies not exercising control).

[3] Jorg Christen, *PFI in Germany – Can we and should we copy the British example?* First European Infrastructure Congress- BuB-Workshop' PFI and public buildings, Jan 2001 Frankfurt.

In view of the importance of SMEs in the national economies, it is very important and timely to analyse the adjustment of PFI projects to SMEs of the construction sector and to examine the most adequate strategies for SMEs under the current and foreseeable PFI market conditions. The main questions to be answered are:

A. Is the PFI market adjusted for SMEs?

B. Are SMEs being left out of the PFI market?

C. Is it feasible or not for a SME to act as sponsor in a PFI project?

D. Does a SME have the required technical and financial capacity?

E. Does a SME have any advantages in entering the PFI market?

F. Which are the main constraints for SMEs in the PFI market?

Our research has provided insight on these issues. The conclusions and suggestions that were drawn are based on empiric data collected both in the UK and Portugal, the countries that within Europe have adopted more extensively the PFI route, and also on opinions of a panel of experts mainly in the financial and project management areas. It is then possible to have an overview of the SMEs positioning in the PFI market and to draw some recommendations regarding the relationship between SME and PFI projects.

The literature review provided very little. The few references to theoretical and empirical studies that were found referred specifically to the non-existence of previous studies on financing of SMEs. Also the London Society for Chartered Accountants[4] on its comments to a Discussion paper 'Prospective financial information: Challenging the assumptions' concluded that the '*paper correctly identified the importance of prospective financial information to the operation of transparent and efficient capital markets and the ability to raise finance. But pointed out the failure of the paper to make its proposals more relevant to the concerns of SMEs, to whom the issue of the provision of reliable PFI for the purposes of raising finance is particularly critical*'. It is clearly a suggestion for future research

A brief characterisation of the construction industry in the UK and Portugal is presented, which is followed by the empiric data collected, the conclusion of the study and key messages for SMEs in the PFI market.

[4] London Society of Chartered Accountants, Technical Committee, Comments on the Discussion Paper: *Prospective financial information: challenging the assumption*, February 2001.

2. THE CONSTRUCTION SECTOR IN PORTUGAL AND UK

In the Portuguese construction sector there are more than 30 000 registered construction companies that account for about 7% of the GDP and employ 9% of the country's total workforce. There are no official data for SMEs, but it is possible to get an overall idea of their weight within the construction sector, by looking at the data for the companies that have less than 100 employees. According to 1995 official statistics (IPMEI, 1998)[5], the number of construction companies with less than 100 employees represented 83% of the total numbers of companies, 74% of the total number of employees, and their business volume is 64% of the construction sector. SMEs represent an even higher percentage, since the contributions from all the companies that have between 100 and 250 employees must be included. The structure of the Portuguese construction sector (Eurostat 2000), defined according to the above mentioned criteria, is very similar to the average structure of the European Union.

The main problems in the Portuguese Construction sector (IAPMEI, 1998) can be grouped in the following areas: Lack of: Adequate Human Resources, Innovation, Investment and Productivity, Management and Organisation Abilities, and very importantly the overall fiscal, regulatory and governmental policy is not favourable. The EU has also recognised that these problems affect SMEs mainly in applicant countries. A significant effort to help SMEs in Central and Eastern Europe (Business Europe, 2000)[6] through its PHARE[7] and TACIS[8] programs has been successfully focusing on improving the legal and institutional environment through lower and fairer taxation, less red tape, orderly bankruptcy procedures, access to commercial courts and better information for both banks and companies.

In the UK there is the more widespread usage of management techniques like value chain analysis and risk management, and the governmental regulatory policy has been adjusted to the PFI specific needs, like for example the accounting standards. In support of these findings research conducted by Monk (2000)[9] indicated that the *'most*

[5] *O Sector da Construção* – Diagnostico e Eixos de Intervenção – IAPMEI, Agosto 1998
[6] *Business Europe*, v.40, n.16, August 2000, p.9.
[7] The process of enlargement of the European Union was launched on 30 March 1998. Negotiations are currently being held with the following twelve applicants: Bulgaria, Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia and Slovenia.
[8] Launched by the EC in 1991, the Tacis Programme provides grant-financed technical assistance to 13 countries of Eastern Europe and Central Asia (Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgystan, Moldova, Mongolia, Russia, Tajikistan, Turkmenistan, Ukraine and Uzbekistan), and mainly aims at enhancing the transition process in these countries.
[9] Monk R. 2000, *Why Small Business Fail*, CMA Management , Jul, p.12.

significant reasons for SMEs failure rate is the inability of SMEs to make use of essential business and management practices'.

There are structural differences between the construction industry in Portugal and in the UK. The construction market in the UK is larger (in terms of business volume) such that a large project such as bridge or a shopping mall doesn't have the same impact as in Portugal where any of these will represent a large slice of the market. Similarly the impact of public works is much greater in Portugal than in the UK, which gives Portuguese companies a strong political power.

In the UK the construction market is more fragmented (about ten big players and fifty intermediaries) than in Portugal with an oligopoly where a reduced number of large companies controls the market. There are more large companies in the UK although their relative weight is smaller than in Portugal due to the larger dimension of the construction market. The large companies in the UK are usually vertically disintegrated sub-contracting the design, quantity surveying etc, while in Portugal the large companies have their own in-house competences recurring to sub-contracting only in very large projects.

There are cultural differences between the two countries. In the UK it is assumed that a contract is a definitive document while in Portugal, the prevailing attitude is that re-negotiation is always an option, leading to great waste in time and money. Companies and owners of the projects have a tradition to revise construction contracts introducing extra-works that are carried out without tender. In Portugal there is still a lax attitude towards the enforcement of regulations, while in the UK companies strictly abide by the regulations including those from the EU.

Other cultural differences between the UK and Portuguese construction sectors refer to the social environment. According to 'A Review of Procurement and Contract Management for the EU' (Eaton 2000[10]), the European national construction industries can be classified according to their cultural, ethical and legal similarities:

- UK and Ireland integrate the '*Common Law Group*';
- Italy, Spain, Greece and Portugal integrate the *'Mediterranean-Romano Group'*.

[10] Eaton D. 2000, Teaching notes of Salford University.

The groups are characterised as:

- *Common Law Group* – The countries have a strong common law history, providing clearly defined and definitive legal traditions and legalistic process. There is a predominance of separate and independent professions. The main contractor significantly dominates total national output, and therefore, a strongly organised and extensive network of sub-contractors and specialists exists to assist. There is a division of legal responsibility, derived from the separation of design from construction. The basis of competition tends to be based upon price and speed (or a combination) rather than quality of output;

- *Mediterranean-Romano Group* - In these countries quality is less emphasised, but might be exceptionally good. The public administration of planning and development is notoriously slow, and is characterised by 'expensive' regulatory mechanisms and the entire administration of procurement and management of projects is bureaucratic and highly politicised. The cultural attitude towards innovation is also different. Portuguese construction companies are less keen to innovate with very often a high degree of resistance to change. A contributing factor being that a significant number of companies is family-owned. In contrast, UK companies tend to envisage innovation as a central factor for competitiveness.

The Portuguese companies are very interactive, with an informed network and are much more flexible than in the UK. This was not happening in the UK with a very fragmented industry where the different partners were doing what they wanted. As PFI forces interaction it is noticeable that this has changed and the integration of the different companies value chains is a great concern of the industry especially because it is so vertically disintegrated.

In Portugal there is a different approach to the PFI methodology from the one that was established in the UK. In Portugal the VFM criteria is not applied, the decision whether to undertake the project, is based on purely political, economical and financial conditions of PFI as a stand alone project not in comparison with a benchmark such as the PSC. Also the existence in Portugal, but not in the UK[11], of significant EU funding was a determinant to the launching of infrastructure projects. The same applies to the European Investment Bank's special financing conditions.

[11] Some EU funding is available in the UK.

3. EMPIRICAL STUDY

Two small successful PFI projects in the UK constitute a good example on how a SME can participate in the PFI market. Both successfully adapted their dimension and expertise to the PFI projects' dimension and concentrated in specialised sectors: Primary Education and Blue Light (ambulances, fire fighting) sectors.

A synopsis of the case study Indáqua Feira is also presented. It is a large PFI sponsored by a small Local Authority. Although from a public perspective it illustrates some of the issues faced by SMEs.

The Victoria Dock Primary School

The Sewell Group is a very sound 120 years old family construction business with headquarters located in Hull Northern England. They went into the PFI market following a long-term strategy of return on investment. They invest mainly their own money (£250,000 for the Victoria Dock Primary School) recurring to traditional bank loans for financial leverage, and regard PFI as an opportunity for investment of their available cash. They go for low risk PFI projects (like schools) and expect to get a return on investment of an average 12-15% instead of 5% in bank deposits. The Sewell financing strategy is consistent with the findings of Romano (2001)[12] that studied the factors that influence funding decisions in family owned SMEs. Romano found that financing through debt is significantly associated with firm size, family control, business planning and business objectives. Equity is a consideration for owners of larger firms, young firms and owners who plan to achieve growth through increasing profit margins, e.g., Sewell that invested their own cash.

Sewell also sees PFI as a strategy to smooth the cycles in the construction industry (usually 10 years cycles), so that in times of depression for the construction industry the company has guaranteed revenue.

Sewell's involvement in PFI projects changed their attitude to business. They reckon that now they are more service oriented instead of asset oriented and look very carefully to whole life cycle costing since now they are also responsible for Operation and Maintenance. Sewell strongly advocates small PFI projects (for example a school is approximately £5 million) to small companies, promoting simultaneously local involvement from the community and workforce. When 5-6 or more school projects are bundled into a sizeable PFI, the large companies are interested in bidding - one school PFI project is not interesting for them. Sewell always uses local labour even when constructing outside Hull because it promotes local employment especially important in depressed areas, as is the case in Hull. Local involvement is also important to good maintenance in non-metropolitan locations like Hull where a big FM company would take too long to replace parts - one day instead of one hour to repair a boiler.

Throughout the process a partnership approach was used, promoting co-operation between all the parties involved.[13] The decision taken by Sewell to promote a 'Community Dividend'

[12] Romano, C.A. Tanewski, G.A & Smyrnios, K.X. (2001) Capital Structure Decision Making: A model for family business, *J. of Business Venturing*, May; 16 (3), pp 285-310.
[13] http://www.sewell-group.co.uk/pfi-base.html.

has enhanced this approach. The Sewell SPV 'The Victoria Dock School PFI Ltd' is to return a proportion of their profit to the community it serves and of which it is a part. As of 2000, it represented around £35,000 that went back to the school and was applied to special projects, like environmental – A Wildlife Wood within the school grounds providing a wildlife habitat in an urban setting and an environmental focus for education.

Previous experience is important to success. The Sewell Group had already constructed schools, had great expertise in building maintenance and refurbishment in schools/hospitals. As a result, when Sewell decided to enter the PFI market they built upon their previous expertise and core business, adjusting their strategy to the long-term perspective of operation and management for a period of at least 20 years. The focus on reducing maintenance and repair costs was a critical issue during project development, as it is their responsibility for the day-to-day building maintenance.

Manchester Fire Station

Carden Croft & Co is a small architectural firm, with great experience in project management. They regard PFI as an opportunity because entering into a long-term business is a way to smooth the ups and downs of the cycles in the construction industry similar to the previous example of The Sewell Group. Likewise for the cycles in governmental policy: if the government needs to fuel the economy it awards more contracts especially for infrastructure projects, vice-versa if the government needs to cool down an overheated economy it withdraws the contracts.

Carden & Co was awarded the PFI project of the Manchester Fire Station, and in 2000 bid for a network of rural fire stations'. It is responsible for construction, operation and maintenance of the Manchester Fire Station (type Full)[14]. Greater Manchester Council (GMC) is the public partner that administers the Greater Manchester Fire Service. Carden Croft feels that GMC had a good sense of what was needed and was very much 'target oriented'. This is not the case of other negotiations where people are not as committed because they are told what to do, rendering the decision process very tricky. Cultural adjustments had to be accounted for in design, as fire fighters are very cultural specific, e.g., they don't like open space offices (where money could be saved) because they regard their own 'territory' as an important mark of rank, the same applies to office footage.

Carden Croft & Co also sees specialisation as a key to success. They will concentrate in the Blue Light sector (Fire fighting and ambulances) because their needs are very similar, e.g., the need to have a quick response to the alarms, the existence of dormitories, etc.

Carden Croft is not a risk taking firm and will always focus in low risk areas like the Blue Light sector, which unlike accommodation where there is high uncertainty regarding the buildings residual value because at the end of the concession this value might be seriously undervalued from the one expected. They also consider hospitals as a complex high-risk sector with too many decision centres.

[14] There are three types of fire stations: Full – including accommodation, Medium and Rural – that operate only part-time.

Indáqua Feira

Stª Maria da Feira[15] is ranked about the 20th Municipality (or between the 10th and 20th)[16] in dimension in a universe of three hundred and twenty five in Portugal. It is a Northern municipality located 270 Km from Lisbon, with 211 Km2 of area, and a population of 130 000. Feira has great economic activity being the world largest centre of cork manufacturing, and other industries like shoe making, toys, wood products, paper, dairy products, etc.

On the 3rd December 1999, Stª Maria da Feira Municipality granted to Indáqua Feira (SPV) two concession contracts for 35 years: first for the water collection and distribution and second for the wastewater sewerage treatment. Indáqua Feira will design and build part of the network of water supply and treatment, and operate the whole system.

It's the first PFI type of project undertaken by a Municipality using European Union (EU) Cohesion Funds to leverage private finance for a major public infrastructure. These funds (85% non-returnable) would directly finance part of the capital works. The Municipality had not enough funds to undertake the project, and could not apply for a commercial loan because the service debt weight on the annual budget has a legally imposed limit of up to 20% of the budget.

Joint financing of the public and private sector was needed because with the level of investment needed it would be impossible to have an adequate return (the financial ratios of the model would not be favourable for the private loans) and simultaneously maintain a reasonable level of tariffs if only private funding would be used.

The PFI project was signed and Indáqua Feira was awarded the concession for water distribution and wastewater in Stª Maria da Feira. The Municipality committed itself to build part of the necessary infrastructure, for which it needed the contribution of the Cohesion Funds. However, in the meantime the political guidelines changed and the Municipalities were not allowed direct access to the funds. This has left the Stª Maria da Feira unable to fulfil its contractual obligations, and has led to a standstill in the construction of the sewerage networks.

[15] Source: Stª Maria de Feira http://www.byweb.pt/santamariadafeira/index.html (accessed 12 September 2000).

[16] Project finance with the local authorities of the coastal region of Portugal seems to be feasible, but in the interior the management, the organization and the procedures are difficult to overcome due to the very small dimension.

4. KEY MESSAGES FOR SMES

The conclusion supported by the empiric data collected in this study, is that SMEs can play an important role in the PFI market. Nevertheless they have to be very attentive because although there are advantages, the existing constraints can lead a project to failure. The bankruptcy of SMEs is a strong possibility because a small company might not have the financial strength to absorb such loss.

- IS THE PFI MARKET ADJUSTED FOR SMES? Yes, but the PFI market is segmented and the SMEs must choose the right segment/niche. (McDonald & Dunbar 1998). [17] [18]

The analysis of the case studies and data collected provided an understanding on how the PFI market works and on the relative importance of key processes to the public and private partners. As such, it is proposed (see Table 1) that the segmentation variables, or dimensions, adequate for the differentiation between projects could be: The *Dimension of the sponsor* and the *Dimension of the contractor*. The market is then divided into homogeneous sectors characterised by the relative dimensions of all parties.

The sponsors of a PFI can be the Central Government that usually launches large projects (defined in terms of project cost)[19] , Local Government that can launch all types of projects from large to small, and the special case of Corporate PFI[20] where a private company tenders for a service provision, the only difference being that there are two private partners instead of one private and one public.

The basic principle, to apply the PFI methodology, is that '*there must exist an adjustment of the project's dimension, to both the concessionaire' and authority'*

[17] Malcom McDonald & Ian Dunbar – Market Segmentation – How to do it, How to profit from it – McMillan Press ltd 2ed 1998.

[18] The definition of McDonald & Dunbar 1998 was adapted as ' *Market segmentation – is processes of splitting the market into different groups or segments, within which the projects have the same or similar requirements?*

[19] Large PFI over £100 million, Medium PFI £50-100 million, Small PFI less than £50 million. Small projects can be bundled to get a larger project.

[20] Corporate PFI is picking up. Some good examples are the building of Smith Klein and Beecham and Marks & Spencer headquarters. This area can prove to be an opportunity for SMEs, as the project's dimension is more adjusted to the company's dimension.

dimension'. According to the PFI market segmentation SMEs can play an important role in Small PFI projects, which very often are not very attractive to large companies.

Table 1. PFI Market Segmentation

	Central Government		Local Government Corporate PFI	
	Large PFI	**Small PFI**	**Large PFI**	**Small PFI**
Large Companies	*Highly Appropriate*	*Not likely to occur*	*Appropriate (conditionally)*	*Not Appropriate*
SME	*Not Appropriate*	*Not likely to occur*	*Not Appropriate*	***Highly Appropriate***

It is reasonable to expect that the negotiation teams from both the public and private sectors are balanced in terms of number and expertise, while special attention has to be given when in the case of large companies and small sponsors (Local Government or Corporations), that the Public Team cannot be understaffed and has to be balanced with the private one in number and expertise.

The adjustment between the relative dimensions of project and sponsor makes sense as small projects require less resources and a narrower range of expertise than large projects. It is important to note that it is the range of expertise that is in question not the degree of specialisation. In effect the research points out that small PFI projects are more suited to specialised companies that operate in market niches. It follows a brief analysis of what can happen if the relative dimensions are not adjusted, i.e., if the project, the sponsor and the private companies are too small.

If the project is too small - From the point of view of a private company interested in investing in the PFI market, a too small project dimension can be solved by establishing a pool of projects with different Municipalities. That is, the financing package is one for all projects (conjoint), but the individual projects are dealt with by the different municipalities involved. However, this solution (currently being tried in Portugal) creates additional problems:

1.There is the need to manage different partners in the different municipalities;

2.There are different municipalities to deal with, and not all of their interests are coincidental;

3.There are always legal problems to solve.

If the sponsor (public partner) is too small – A good example is the concession of the build and management of the water supply and wastewater sewerage systems in Stª Maria da Feira. This Municipality is not the smallest in Portugal; it is ranked about the 20th [21] in a universe of three hundred and twenty five in Portugal. Even so, it is considered too small to undertake or manage a project such as this. The issue is not financial capacity to undertake the project, but the lack of management ability and skills. It is essential for the success of PFI projects that the Municipalities that currently are seriously understaffed can constitute stable and (relatively) autonomous teams to manage these projects.

If the private companies are too small (like SMEs) - The explanation for a too small sponsor also applies to small private partners like SMEs. To solve the problem and achieve an adjusted dimension a consortium can be formed but the number of companies in the consortium will be greater than if the companies involved were large. This has two opposing effects:

- Positive – The number of competences increases (it is reasonable to assume a combination of different competences)
- Negative – The entropy increases – more co-ordination efforts, more adjustments are needed.

- ARE SMEs BEING LEFT OUT OF THE PFI MARKET? No. SMEs can always participate in this market as a sub-contractor, i.e., it participates in the project but it is sub-contracted by the concessionaire. As such, it is playing the same role as in the normal market providing services to the consortium. It is important to understand that the aim of PFI is the provision of good quality

[21] Project finance with the local authorities of the coastal region of Portugal seems to be feasible, but in the interior of the country, management, organization and the procedures are difficult due to the very small dimension of the municipalities.

services. SMEs might find it harder to deal with the concessionaire than a regular client, as the first has very rigorous quality standards.

- **IS IT FEASIBLE OR NOT FOR A SME TO ACT AS A SPONSOR IN A PFI PROJECT?** Yes provided that there is adjustment between the SMEs' dimension and that of the PFI project. A Partnering approach is beneficial – This comes as a pattern in our study and is often adopted, although informally, through the pre-existing good personal interrelations in the local community

- **DOES A SME HAVE THE REQUIRED TECHNICAL AND FINANCIAL CAPACITY?** Yes, provided that two factors are considered: *Specialisation* focussed in core competences, and *Investment in low risk sectors*, enabling a straightforward decision, and providing low uncertainty in revenues, are the key factors to consider. In principle there is no problem applying project finance (the PFI financing technique) to a SME.[22] But the project has to be adjusted to the promoter's 'balance sheet'. It is always necessary to make a preliminary assessment of their financial capacity. Although the banks consider that construction risk is the most important risk involved, their main criterion to assess the promoter's strength is how strong is both the constructor's and operator's balance sheet (which a priori favours the big players). There is another factor that SMEs must take into account: PFI tenders are complex and take much longer to discuss than with regular procurement, which makes them more costly. In the UK it is not uncommon that the tender stage takes up to two years, while with conventional procurement it would take four months

- **DOES A SME HAVE ANY ADVANTAGES IN ENTERING THE PFI MARKET?** Yes, several advantages can be envisaged:

- *PFI must be viewed as an opportunity* to enter into a long term business that can smooth the ups and downs of the cycles in the construction industry. Likewise for the cycles in the government policy: if the government needs to fuel the economy it awards more contracts mainly for infrastructure projects,

[22] Banco Português de Investimento – Interview.

vice-versa if the government needs to cool down an overheated economy it withdraws the contracts. If SMEs are sub-contracted one potential benefit is security (Blackman, 2001)[23], e.g., to provide services such as cleaning and catering the terms available to a PFI subcontractor are often more stable (five to seven years) than those on offer when dealing directly with the client (one to three years).

- *PFI can increase efficiency.* It is important to make clear that although PFI started as a need to capture private funding to central government projects, it soon overcame that status and became an innovative way to do business in the construction sector. It was how the contract was formulated, shifting the contract's objective from construction of a physical asset to the sole objective of a service provision (usually preceded by the construction of the asset) and giving to the private sector the initiative to manage the service (plus design and construct the asset that physically supports the service) that constituted the key factor for improvements in efficiency leading to better Value for Money – another key driver for the launching of PFI. In the sense of providing good quality services it is an opportunity for a company to improve its competitive advantage by improving efficiency;

- *PFI enables technical staff to focus on their core competences and relieves them from the administrative and managerial jobs* - The Victoria Dock School Head Mistress seems very pleased to concentrate only on education activities. Her role in the school management is now that of a performance monitor. The same happened in The Manchester Fire Station, where a PFI scheme relieves the firemen from the administrative and managerial jobs enabling them to concentrate only in their area of expertise: fire fighting;

- *The involvement in PFI projects changes the attitude towards business.* A good example is The Sewell Group that reckon that they are now more service oriented not asset oriented and look very carefully to whole life cycle costing since they are responsible for Operation and Maintenance of the Victoria Dock Primary School.

[23] Blackman D. 2001, A match made in heaven, *Director Magazine*, v.54, n.9, pp 42-46.

- **WHICH ARE THE MAIN CONSTRAINTS FOR A SME IN THE PFI MARKET?**

- *Joint Ventures with Public sector are often needed to secure financing.* For example, in the Victoria Dock School PFI project, the City Council paid £200,000 that was covered by Central Government. Otherwise it wouldn't be possible to establish a favourable comparison with the PSC. The same happened with Indáqua Feira where the Local Authority had to contribute to the project to keep tariffs down to a socially acceptable level;

- *Companies have to look carefully to their project teams.* In a negotiation the existing competences and even also the sheer number of people is very important. Why number? Twenty heads think better than four (or less in some cases). The overall capacity of the human resources has to be evaluated, because of the need to establish autonomous teams to manage the projects (or other new projects). Large companies have their own in-house PFI project teams, for example the technical and legal teams;

- *A PFI bid is always very costly.* As bidding costs are very high small companies have to be very attentive and evaluate if they can afford to lose upfront costs (a bid typically costs at least £1 million). The costs of unsuccessful bids are passed on to subsequent projects otherwise companies might face collapse. Companies must win at least 50% of the bids, otherwise they should stay out of PFI market.

5. CONCLUSION

The focus of the current study was on the construction sector, because it is a sector that is deeply involved in PFI and where most experience has been gathered since all projects must go through the construction stage first. Nevertheless the conclusions that were reached are generic and can easily be applicable to SMEs of other sectors, including the services sector so important in the Operation and Maintenance stage. The analysis provided a valuable insight on the problems that SMEs face in the PFI market, and on the strategies that they can adopt.

Of special concern to SMEs is the possibility to raise finance. Traditional corporate loans (or equity) are always viable options if included in the company's strategy, but the access to other financing like capital markets is not adapted to SMEs. To tackle this problem in 1999 Schroders and the Rotch Property Group[24] studied the launch of a Eurobond issuance programme to help finance medium-sized PFI type projects worth £10m-£50m that have had problems financing. Small PFI around £5m get their loan guaranteed by their assets on the balance sheet, and large projects are financed through bank loans or by the issuance of bonds in the international financial markets; this had left a gap in the market for medium-sized PFI projects.

If financing is solved a SME can be the concessionaire of a successful PFI, focusing in specialisation and low risk sectors. Nevertheless it has to be very attentive because PFI is very demanding on the provision of good quality services and SMEs face specific constraints regarding the availability of technical and human resources.

SMEs can always be sub-contracted in a PFI, which might give them increased security ensuring, over a longer period of time a steady stream of income. But even then SMEs must be aware that PFI is very demanding regarding efficiency and quality and that a sub-contractor must also abide by this philosophy.

Lastly and of critical importance: If SMEs are to be a player in the PFI market the Government must provide appropriate guidance and include in its strategic objectives a legislative and regulatory framework[25] adapted to SMEs.

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[24] Eurobond programme offers hope to small PFI deals, *Project Finance*, August 1999.

[25] An example is the UK' government concern regarding the sophisticated equity markets that enabled a wide range of companies to raise capital efficiently. '*Institutional investors - pension funds and life assurance companies - are key players in those markets, controlling around 45 per cent of quoted equity investments. The government is concerned that there may be factors encouraging institutional investors to follow industry-standard investment patterns which focus overwhelmingly on quoted equities and gilts and avoid investing in SMEs and other smaller companies*', Budget 2000 Red Book: in search of a strategy to encourage enterprise, Financial Times, 22 March 2000.